Nera Mini-C
Service Manual

INMARSAT MINI-C MOBILE EARTH STATION

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enabling a wireless future

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1. Installation

Table 1 lists check items for installation.

Table 1. Check list for installation

No.	Item to be checked		Result
1	Power cable	Wire size is appropriate? The system consumes 6.0 A/12 V and 2.0 A/24 V when transmitting.	
2	Antenna cable	Cable is selected according to the length. 15m: TP58A15W-RG58 30m: TP5FBAW-5DFBB 50m: 8D-FB-CV 100m: 12D-SFA-CV	
3	Waterproofing	The antenna connector is waterproofed properly.	
4	Grounding	Antenna unit (IC-116)	
		Terminal unit (IC-215)	
		Power supply unit (PR-240)	
5	PR-240	Modification is required for supply voltage of 110 VAC. No modification is required for 220 VAC. See page 4-7.	
6	Connection	All connections are tight.	
7	Indication	The terminal unit is labeled IMN.	

2. Program number

The program version is displayed in “Diagnostic Test” menu (keystroke: [F7]-7-3). Type “Nera” while pressing [Ctrl] to show numbers after the decimal point.

Table 2. Program number

Program	Revision level	
F16 PC Terminal	1650166-01.xx	Ver.
RF CON/CPU	1650160-01.xx	Ver.

3. System Settings

Table 3 lists check items for menu setting.

Table 3. Items to be checked

No.	Items to be checked		Result	Page
1	System setup ([F8]-1)	Date & Time		4-1
		IMN (Type “IMN” while holding [ALT] for reentry.)		
		MES Operation Mode (INMARSAT C or EGC)		
2	Print Setting ([F8]-8)	Selects the printer to be used. (PP-510, Windows Printer or No printer)		4-6

4. Function

Table 4 is functional check list.

Table 4. Functional check list

No.	Items to be checked		Result	Page
1	Error message	No error message in the screen		5-6
2	Diagnostics Test	No error in Diagnostic Test result ([F7]-7-3)		5-5
3	Status	Position		5-7 to 5-9
		Course/Speed (VTG data)		
		Current NCS (Selected visible satellite)		
		Antenna Power Supply		
		BBER: OK		
		C/N; OK (31 to 34 dB or above)		
		Rx AGC Level: OK		
		REF Offset Freq.: OK		
		Synthe Local: OK		
		Send Level (“0” when receiving; “255” when transmitting)		

5. Communication test

Before the test, make sure that;

1) C/N in the status display is OK.
2) C/N reading is stable.
3) "Current Status" is "Idle".
4) Antenna is not blocked.

Step 1. Log in

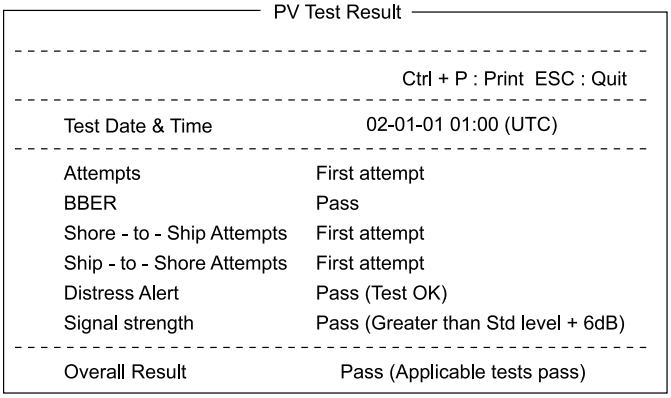
Press [F7] and then [1] for login. Table 5 lists typical error message at login.

Table 5. Error message

Error message	Cause	Remedy
ANT Power voltage abnormality	The supplied voltage error for the antenna unit	- Change IC-116 or PWR board. - Check antenna cable.
Too many retries.	The system fails to login.	- Change IC-116 or RF - CON/CPU board.
MES Signaling Failure, Login Request not sent to NCS.		
Login failed.		

Step 2. PV test

Press [F7] [7] and [1] in order to carry out PV test. It is not necessary to operate until the test is completed. Escape from PV test mode when "Pass" appears in Overall Result line.


PV Test Result
Ctrl + P : Print ESC : Quit
Test Date & Time 02-01-01 01:00 (UTC)
Attempts First attempt
BBER Pass
Shore - to - Ship Attempts First attempt
Ship - to - Shore Attempts First attempt
Distress Alert Pass (Test OK)
Signal strength Pass (Greater than Std level + 6dB)
Overall Result Pass (Applicable tests pass)

Step 3. Loopback test

Loopback test is a test which a test message is send to own ship. To perform the loopback test;

1. Create test message ([F1]-1).
2. Complete settings in “Transmit Message” menu ([F3]-1) as below.
   - Priority : Normal (Fixed)
   - Destination Type : TELEX
   - Country/Ocean Code: Choose ocean region.
     (POR: 582, IOR: 583, AOR-W: 584 or AOR-E: 581)
   - Station ID : Enter IMN of own ship.
   - LES ID : Choose an LES.
   - Option
     - Confirmation : ON
     - Send Delay : 00:00
     - Delivery Delay : Immediate
     - Code : IA5
3. Move the cursor onto “Transmit” and press [Enter].
4. Select “YES” and press [Enter] to start the transmission.
5. If the transmitted message is received after 5 to10 minutes, the test is OK. If not, confirm “Delivery” status in “Send Message Log” ([F6]-1). See page 5.
6. Print out transmitted and received messages for a record.

6. Commissioning

Explain the system to the user after installation especially on the following points.

1) The system is a Inmarsat MINI-C without distress alert function.
2) The system uses LES which supports MINI-C.
3) How to register “station list”.
4) How to “log in/log out”.
5) How to send a fax and E-mail.
6) How to confirm “delivery status”.
7) How to save and load system settings, such as station list. See page 5-16.
8) Service call includes following items.
   - Fault description (including how often)
   - Result after changing Ocean region and LES
   - Indications in status monitor
   - Error message

Non-delivery Notification Failure Codes

ABS	Absent subscriber. The mobile terminal is not logged-in to the ocean region.
ACB	Access barred.
ADR	Addressee refuses to accept message.
ANU	Deleted. The message has not been delivered within an hour and is therefore deleted.
ATD	Attempting to deliver the message.
BK	Message aborted. Is used when a fax or PSTN-connection is cleared abnormally.
BUS	Busy.
CCD	Call cut or disconnected.
CI	Conversation impossible.
CIE	The CES ran out of processing/communications capacity to process your message.
CNS	Call not started.
DTE	Data terminal equipment. Used when an X.25 subscriber has cleared the connection during the call attempt.
ERR	Error.
FAU	Faulty.
FMT	Format error.
FSA	Fast select acceptance not subscribed.
IAB	Invalid answerback from destination.
IAM	Was unable to process the address information in the following message:
IDS	Invalid data from ship.
IDT	Input data timeout
IFR	Invalid facility request.
IMS	Message size is invalid, 7932 characters maximum.
IND	Incompatible destination.
INH	Was unable to establish the type of message from following header:
INV	Invalid.
ISR	Invalid ship request.
LDE	Maximum acceptable message length or duration has been exceeded.
LEF	Local equipment failure.
LPE	Local procedure error.
MBB	Message broken by higher priority.
MCC	Message channel congestion.
MCF	Message channel failure.
MKO	Message killed by operator.
MSO	Machine switched off.
NA	Correspondence with this subscriber is not admitted.
NAL	No address line is present.
NC	No circuits.
NCH	Subscriber’s number has been changed.
NDA	There was no delivery attempt.
NFA	No final answerback.
NIA	No initial answerback.
NOB	Not obtainable.
NOC	No connection.
NP	No party. The called party is not, or is no longer, a subscriber.

NTC	Network congestion.
OAB	Operator aborted.
OCC	Subscriber is occupied.
OOO	Out of order.
PAD	Packet assembler/disassembler.
PRC	Premature clearing.
PRF	Protocol failure.
RCA	Reverse changing acceptance not subscribed.
REF	There was a failure in the remote equipment.
RLE	Resource limit exceeded.
RPE	Remote procedure error.
RPO	RPOA out of order.
SCC	Call completed successfully.
SHE	MES hardware error.
SNF	The satellite network has failed.
SPE	MES protocol error.
SUC	Test results being delivered.
TBY	Trunks busy.
TGR	TDM group reset.
TIM	Timeout.
TMD	Too many destinations.
UNK	Unknown. Is used when no other failure code are suitable.
WFA	Wrong final answerback.
WIA	Wrong initial answerback.

Chapter 1. General

1.1 General

Nera Min-C is a Class 2, Inmarsat mini-C system, designed for non-GMDSS ships such as a pleasure boat, a yacht and a fishing boat. The unit is smaller in size, less power consumption and lighter than Nera C. Nera Mini-C can be used as VMS (Vessel Monitoring System) unit. The table below lists the difference between Nera Mini-C Nera C in specification.

System Name	Model	EIRP	G/T
Inmarsat C (Normal model)	Nera C	12 to 16 dBW	-23.0 dB/K
Inmarsat mini-C	Nera Mini-C	7 to 16 dBW	-23.7 dB/K

Nera Min-C, operating from +12 to +24 VDC, consists of a communication unit and an antenna unit. A PC with the terminal software is used as a terminal unit. When Nera Mini-C is used as a VMS unit, the PC is not connected. Nera Mini-C does not provide the connection of a distress alarm unit and an incoming indicator.
The operation on the terminal unit is the similar Nera C.

Table 1.1.1 Comparison list between Nera C and Nera Mini-C

	Nera C	**Nera Mini-C**
Power supply	DC 12 V to 24 V TX: 13.0 A to 5.0 A; RX: 1.7 A to 0.9 A	DC 12 V to 24 V TX: 6.0 A to 2.0 A; RX: 0.6 A to 0.4 A
Antenna unit	156(diameter) x 258 (H), 1.4 kg	Same as left*1
Communication unit	270 (H)x320 (W)x112 (D), 4.5 kg	42 (H)x210 (W)x145 (D), 1.2 kg
Terminal unit	Indicated in communication unit. Color LCD	PC
Printer	PP-510	PP-510 or commercial printer
Distress alert Button/unit	Distress alert button on communication unit and distress alert unit (IC-305)	Not available
Incoming Indicator	Standard 2 sets (Maximum 3 sets connectable)	Not available
EXT DTE port	Yes (for PC)	Yes (for PC)*2
D-GPS port	Yes	Not available
Built-in GPS	Yes (GN-79, optional)	Yes (GN-79)
LAN	Yes (10BASE-T)	Not available

*1) The antenna unit is the same as Nera C physically, but not in circuitry. Do not use IC-115 for Nera Mini-C. PWR board will be damaged because the power consumption of IC-115 is larger than IC-116. IC-116 may be used for Nera Mini-C for test. If so, the output power drops about 5 dB.

*2) Not compatible with Nera Mini-C. (Different software)

1.2 Configuration

The antenna unit is connected to the communication unit with a coaxial cable: 15 m, 30 m, 50 m or 100 m. 15 m and 30 m cables have TNC connectors at both ends, and 50 m and 100 m cables have N-type connector at the antenna side. 30 m cable is the same as that of Nera C.

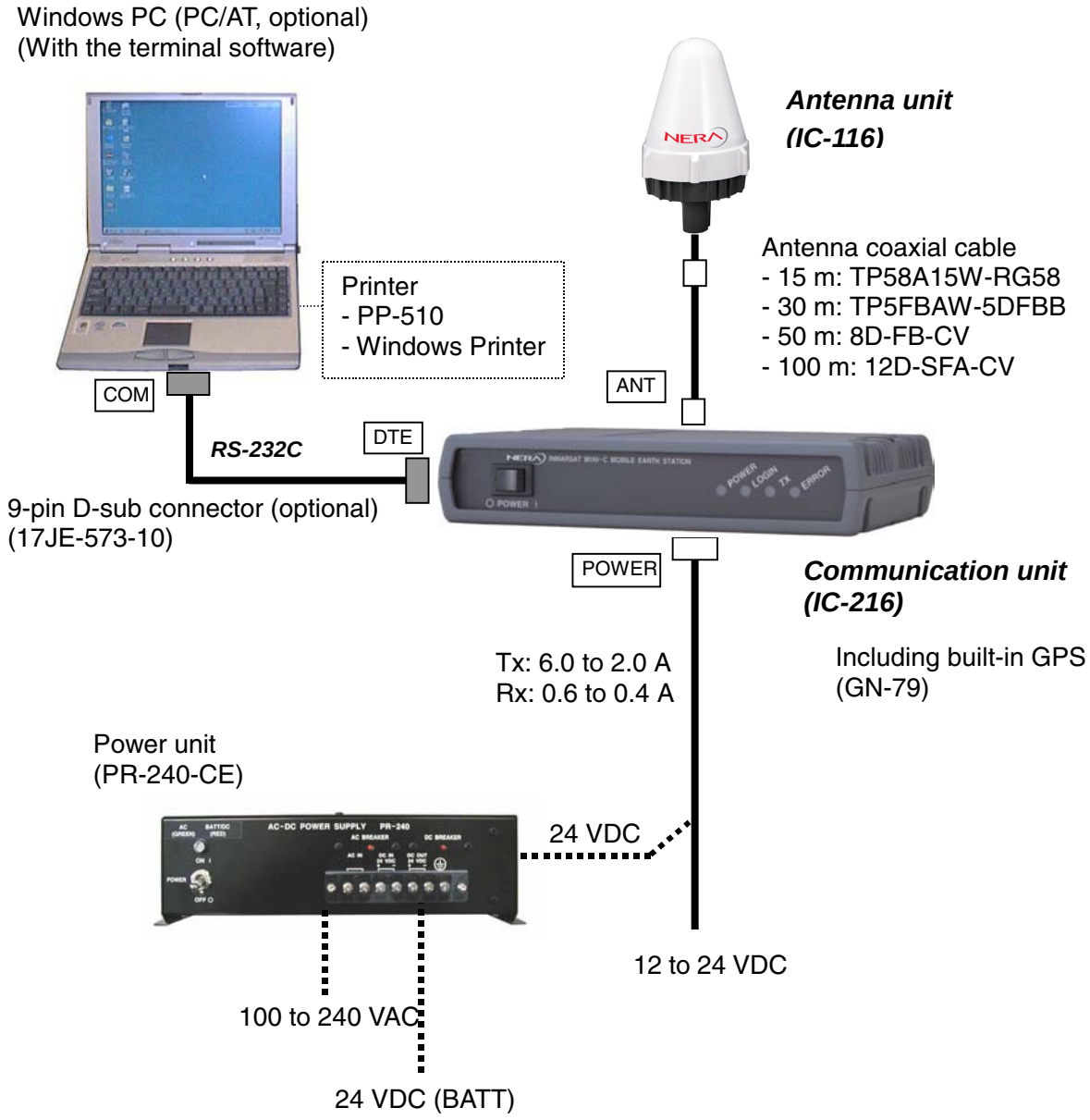


Fig.1.2.1 Nera Mini-C system configuration

1.3 Connection

1.3.1 Antenna unit

The antenna unit, IC-116 is connected to ANT connector on the communication unit, IC-216 with the coaxial cable. The coaxial cable carries 1530.0 MHz to 1545.0 MHz receiving signal, 1626.5 MHz to 1646.5 MHz transmitting signal, 1575.42 MHz GPS signal and power to the antenna unit. The coaxial cable attenuates the RF signal about 10 dB at 1.6 GHz. Different voltages are supplied from the communication unit to the antenna unit; TX: +29 V and RX: +7 V.

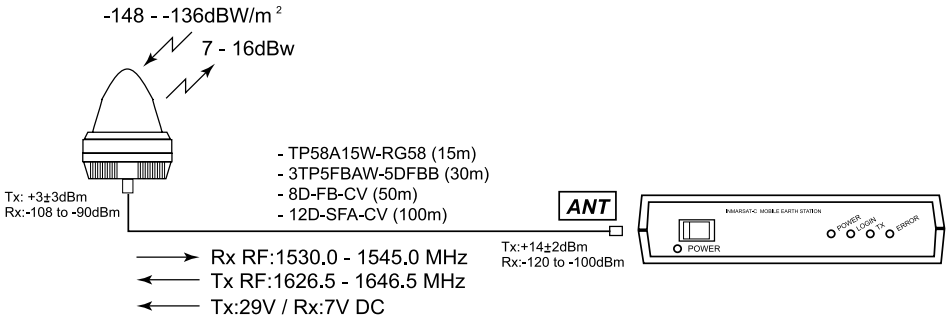


Fig.1.3.1 Connection of antenna unit to terminal unit

1.3.2 PC (Terminal unit)

A PC with the terminal software is connected to [DTE] port, using a straight cable. Terminal software supports up to 6 COM ports and recognizes the port in use automatically.

1) Connector : 9-pin D-Sub
2) Interface : RS-232 C
3) Communication speed : 4,800 bps
4) Data format : one Start bit, eight Data bit, odd parity bit and one stop bit
5) Signal lines : TXD, RXD and GND

1.3.3 Printer

Commercial printer for Windows and PP-510 can be connected to “Printer” or LAN port on PC. Printer setting is made through “Printer setting” menu ([F1]-8).
With the commercial printer, error messages, such as “WARNING, TROUBLE: XXX” are not printed out.
It is unnecessary to install the driver software onto the PC when PP-510 is used.

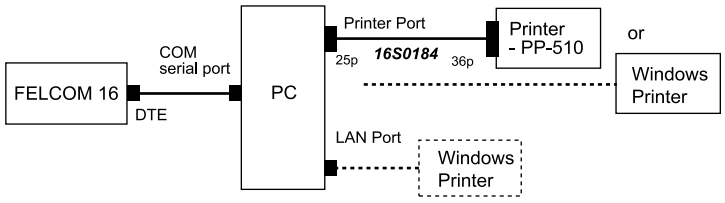
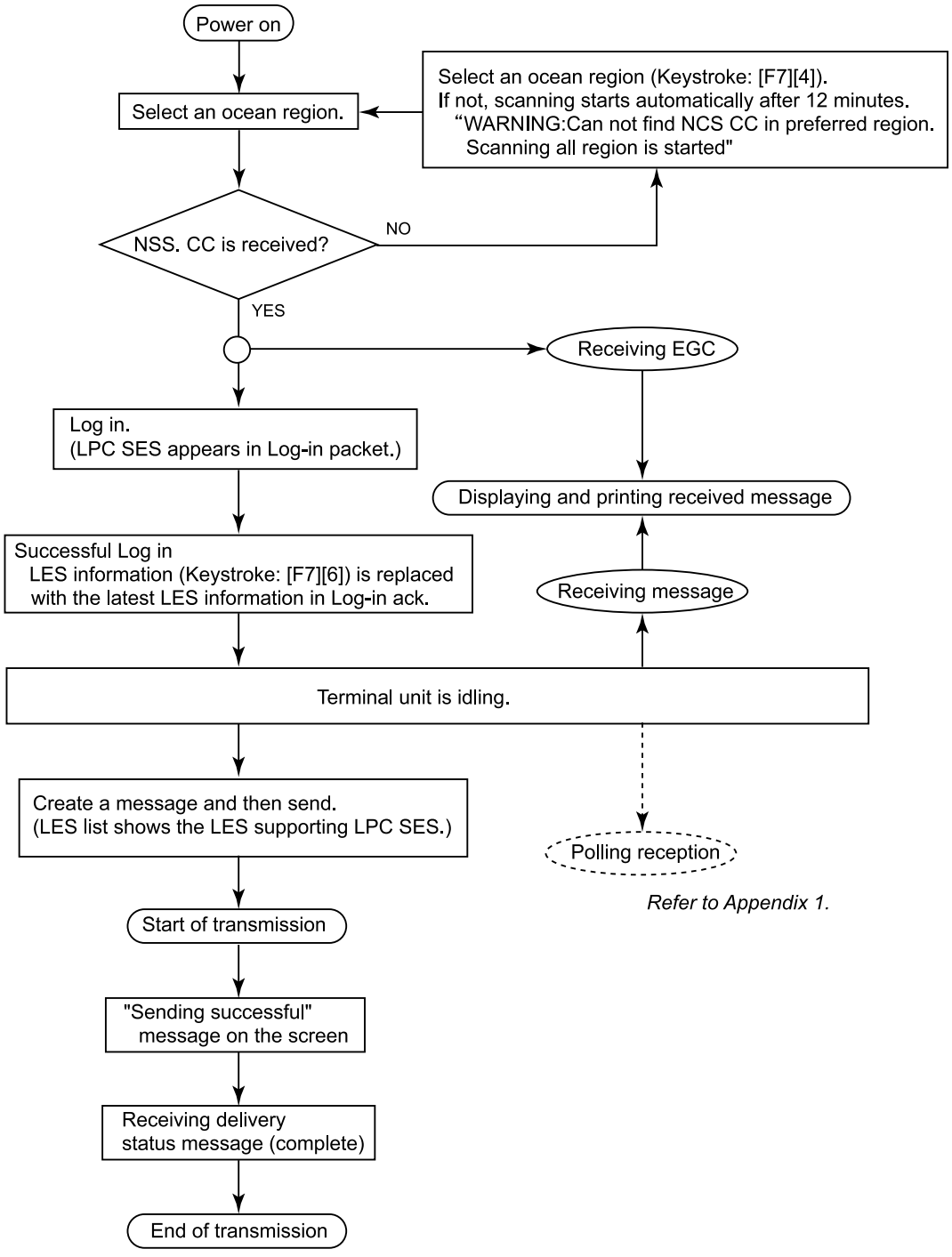


Fig.1.3.2 Printer Connection

1.4 How to fill out application form

Inmarsat serial number (4FE088xxxxx) on the name plate is filled in the application form, instead of Nera serial number. Inmarsat serial number consists of a hexadecimal digit of type approval number (4FE088) and forward ID.

1.5 Operational flowchart


Power on
Select an ocean region.
Select an ocean region (Keystroke: [F7][4]).
If not, scanning starts automatically after 12 minutes.
"WARNING:Can not find NCS CC in preferred region.
Scanning all region is started"
NSS. CC is received?
NO
YES
Receiving EGC
Log in.
(LPC SES appears in Log-in packet.)
Displaying and printing received message
Successful Log in
LES information (Keystroke: [F7][6]) is replaced
with the latest LES information in Log-in ack.
Receiving message
Terminal unit is idling.
Create a message and then send.
(LES list shows the LES supporting LPC SES.)
Polling reception
Refer to Appendix 1.
Start of transmission
"Sending successful"
message on the screen
Receiving delivery
status message (complete)
End of transmission

2.1 General

2.1.1 Block diagram of Nera Mini-C

Fig.2.1.1 shows the block diagram of Nera Mini-C.

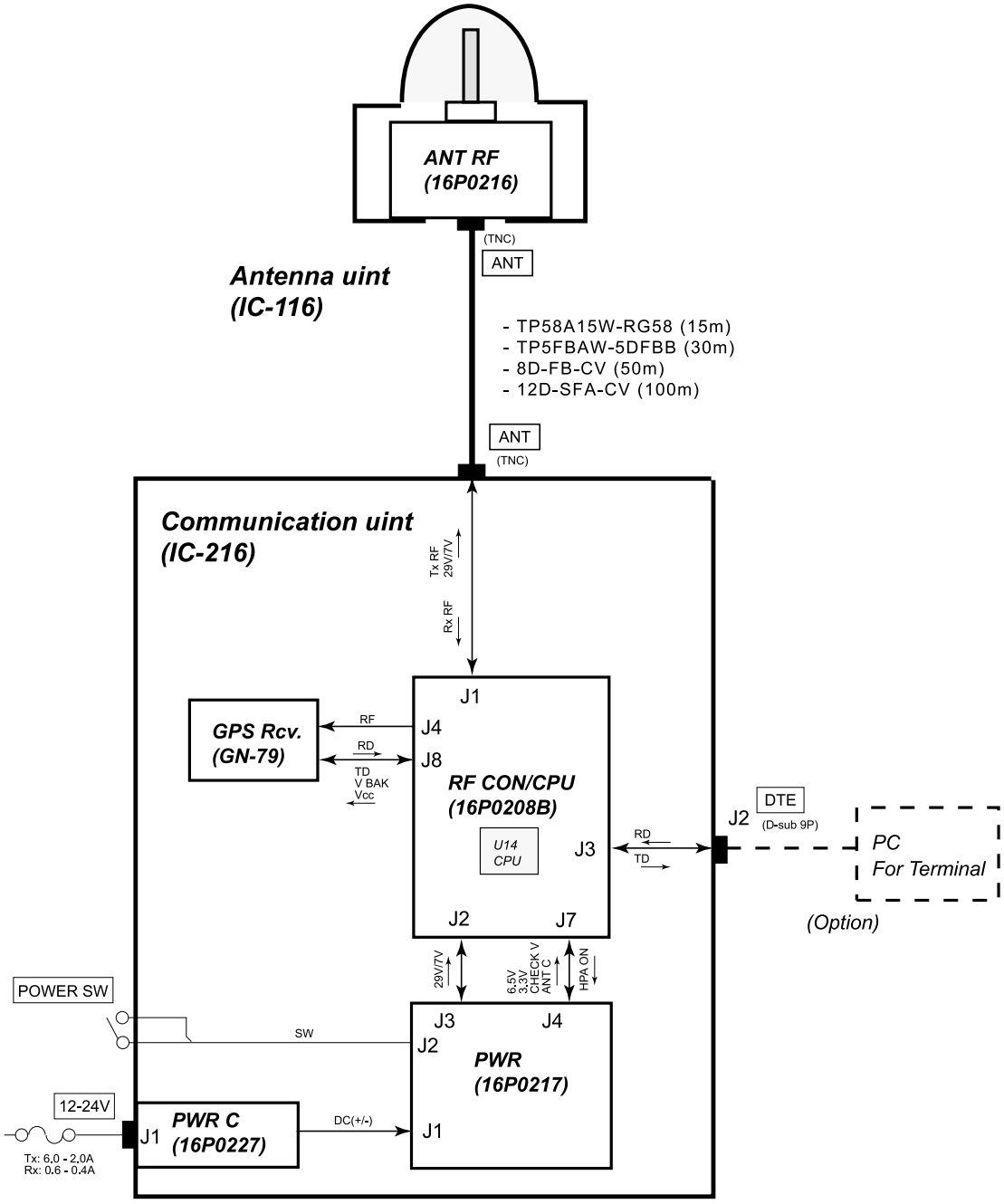


Fig.2.1.1 Block diagram of Nera Mini-C.

2.1.2 Boards in each unit

Table 2.1.1 lists the function of boards in each unit.

Table 2.1.1 Boards in each unit

Unit	Board	Function	Remarks
Antenna (IC-116)	ANT RF (16P0216)	1) Consisting of RF amplifier circuit and the dielectric filter which dividing TX/RX signal. 2) Changing TX and RX circuit by antenna supplied voltage, TX 29 V/RX 7 V. 3) Automatically the transmission is stopped when the temperature of the board is over +95 °C. - Receiving gain: 36 dB±3 dB NF=2.0 dB max. (Output: -108 to -90 dBm) - Transmitting gain: Outputs +37dBm by inputting +3 ±3 dBm - Continuous-time of transmitting: 8 minutes	The difference from Nera C. ANT RF output power - Nera C: 41 to 44dBm - Nera Mini-C: 37 to 40dBm
	Daisy loop type antenna	Directional characteristics Horizontal: Non-directivity Vertical: EL=90°: 0 dBi and more EL= 5°: +1.3 dBi and more Polarization Right circular polarization wave	
Commu -nication unit (IC-216)	RF CON/CPU (16P0208B)	RX: Changing RF signal, -120 dB to –100 dBm from antenna unit to I signal and Q signal of the base band. After decoding, the signal is sent Term CPU board. TX: After encoding the data from Term CPU board, the data is modulated at DDS and changed to TX RF signal, +14 dBm. Oscillation circuit: The following frequencies are oscillated at DDS and PLL synthesizer circuit. TX=1626.5 MHz to 1646.5 MHz RX=1530 MHz to 1545 MHz EEPROM(U15): Memorizing FW/RT ID, DNID and ENID. See page 2-27.	When replacing RF CON/CPU board, remove the EEPROM(U15) from old board and put it on the new board.

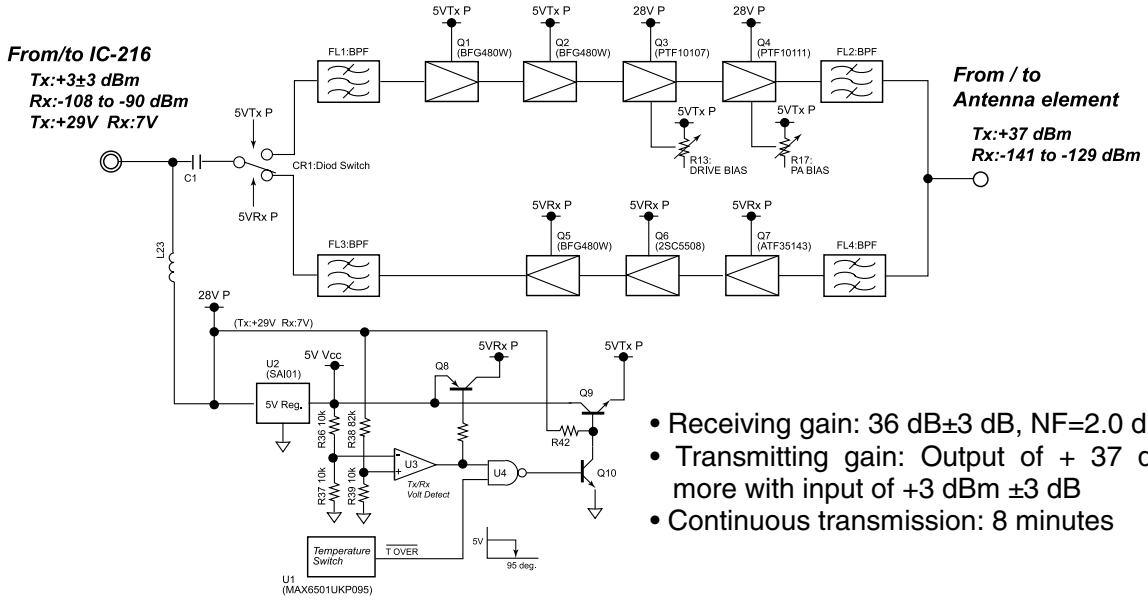
Commu-nication unit (IC-216)	PWR (16P0217)	Switching power supply Input voltage: 10.8 V to 31.2 V Output voltage: 29, 7, 6.5, 3.3 V and LCD power supply Detecting status monitor signal: - CHECK V: Antenna Power supply - ANT C: Send Level (not used) Changing ANT TX/RX power supply by HPA ON signal	
	PWR C (16P0227)	Consisting of the bypass capacitor for EMC.	
	GPS Receiver (GN-79)	12 CH parallel GPS receiver. Outputs GLL, GGA, VTG, RMC, GSV and ZDA by IEC-61162 data.	

2.2 Antenna unit, IC-116

The antenna unit consists of ANT RF board (16P0216) and a daisy loop antenna.

2.2.1 ANT RF board (16P0216)

ANT RF board consists of TX and RX RF amplifier circuits, voltage selection circuit and overheating protection circuit. The band pass filter is fitted at the input and output of the RF amplifier to select the specified RF signal. The filter attenuates unwanted RF signal 30 dB or more. Fig.2.2.1 shows the block diagram of the ANT RF board.



- Receiving gain: 36 dB±3 dB, NF=2.0 dB max.
- Transmitting gain: Output of + 37 dBm or more with input of +3 dBm ±3 dB
- Continuous transmission: 8 minutes

Fig.2.2.1 Block diagram of ANT RF board

The voltage selection circuit consists of U3 (comparator), Q8 and Q9. When transmitting, 29 V from the communication unit is supplied to U3, and 5 VTxP is generated by Q9. When receiving, 7 V is supplied to U3 and 5VRxP is generated by Q8. The transmission stops automatically when the board rises to +95 °C. Here is how the protector works. When the temperature sensor U1, locating at the center of the ANT RF board, is on, the output of U4 is High, Q10 is on and Q9 goes off.

2.2.2 Antenna

Antenna consists of a birdcage-shaped element, a 3 dB hybrid board and a reflector. The antenna, called “Daisy Loop” antenna, is patented. ANT RF board outputs +37 dBm RF signal to the antenna element via 3 dB hybrid board. Antenna element has 9 dBW EIRP (Equivalent Isotropically Radiated Power) signal at 1.6 GHz. When receiving, the antenna element picks up 1.5 GHz, –148 to –136 dBW/m^2 signal. The input level to ANT RF board is –141 dBm to –129 dBm.

- TX/RX antenna gain: more than 1.3 dBi
  (at +5° elevation)
- Directional characteristics
  Horizontal: Omni-direction
  Vertical: 1.3 to 1.5 sin (El - 5) dBi
  (+5° < El <+90°)
  -2.7 cos + 4 cos [4.5 (El - 5)] dBi
  (-15° < El <+5°)
- Polarization: Right circular

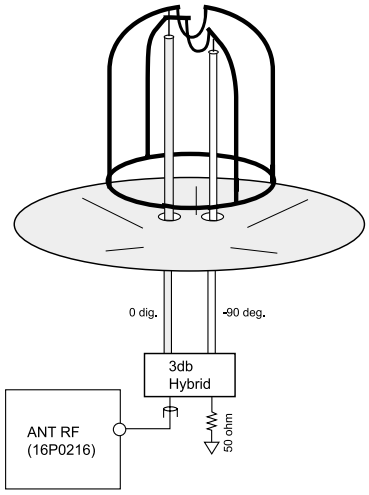


Fig.2.2.2 Antenna element

Fig.2.2.3 shows the vertical radiation pattern of the antenna, horizontally omni-directional on 1.5GHz band.

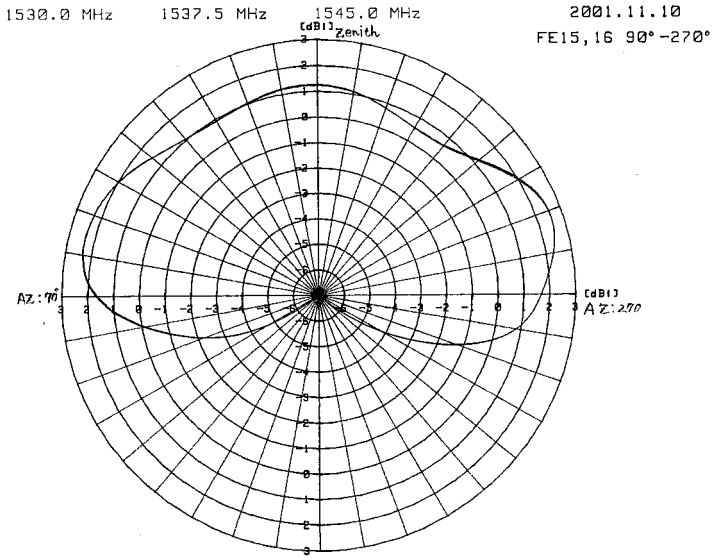


Fig. 2.2.3 Vertical radiation pattern

2.3 Communication unit, IC-216

The communication unit mainly consists of PWR board (16P0217) and RF CON/CPU board (16P0208B). RF CON/CPU board communicates with the PC (terminal unit) via RS-232C.

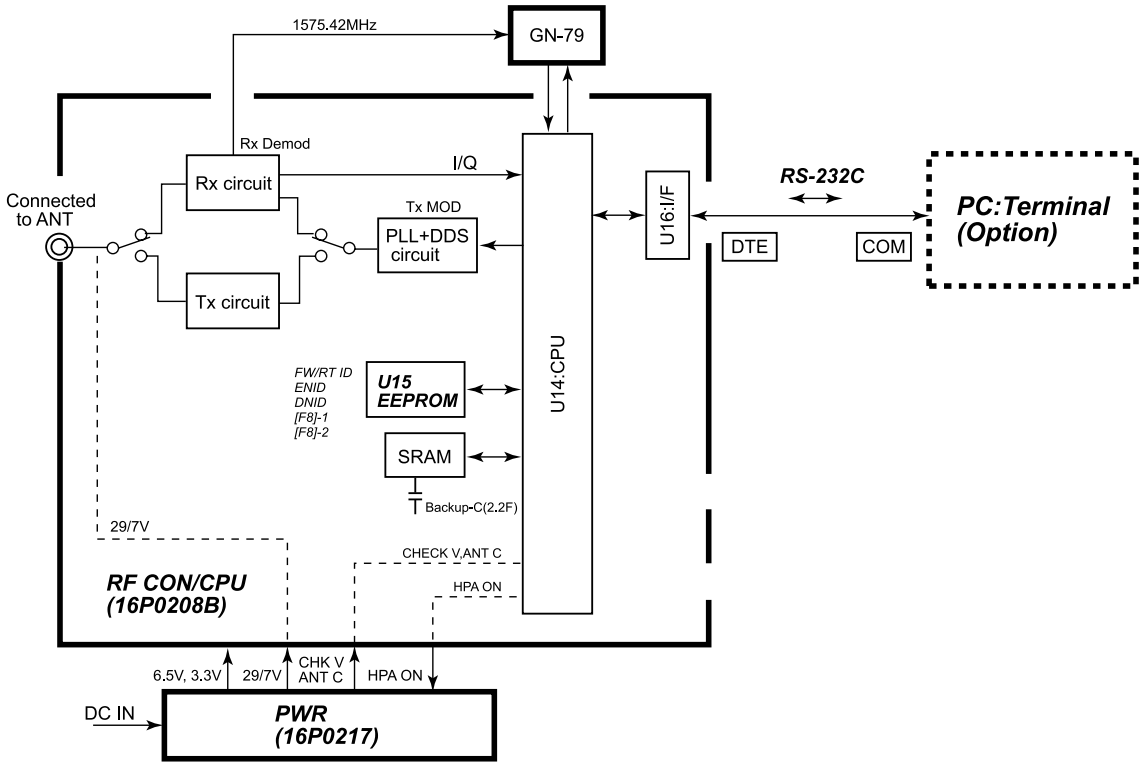


Fig.2.3.1 Block diagram of communication unit

Note)
EEPROM, U15 on RF CON/CPU board retains Forward/Retune ID, ENID (EGC Network ID) to access EGC FleetNET broadcast service and DNID (Data Network ID) to access data reporting service.
The replacement board should have this IC removed from the original board.

2.3.1 RF CON/CPU board (16P0208B)

RF CON/CPU board is divided into three circuits and each circuit functions as below.

1) Analog circuit

The analog circuit processes TX and RX RF signal. (See sections 2.3.3 and 2.3.2.) Major function includes;

- Delivering RF signal to GPS board (GN-79)
- Converting RF signal to 1.2 kHz IF signal
- Generating TX/RX carrier signals in 2.5 kHz step by PLL synthesizer circuit
  TX: 1626.5 MHz to 1646.5 MHz
  RX: 1530.0 MHz to1545 MHz
- Performing BPSK modulation with DDS (Direct Digital Synthesizer)

Fig.2.3.2 shows how the synchronous detection circuit works.

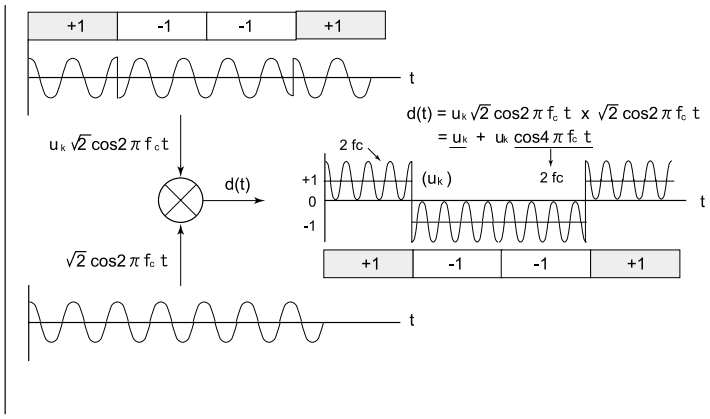


Fig.2.3.2 Theory of synchronous detection circuit

2) CPU (Digital) circuit

CPU, HD64F7065 is a 32 bit single tip microcomputer with DSP function. It includes ROM (256 kbyte), RAM (8 kbyte), A/D (8 channels), D/A (2 channels), Timer (8 channels), watch-dog timer (1 channel) and Serial communication I/F (3 channels).
RF CON/CPU board communicates with the PC (terminal unit) via RS-232C interface.
See section 2.3.5 for further details.
Function of the CPU circuit includes;

- Controlling Inmarsat C communication protocol
- Processing TX/RX signal
- Selecting TX/RX signal
- Controlling AGC, PLL and DDS circuits
- Communicating with PC (terminal unit)
- Handling IEC-61162 (NMEA) data
- Monitoring SYN, CHECK V (supply voltage to antenna) and ANT C (Antenna current)

Fig.2.3.3 shows CPU and associated parts.

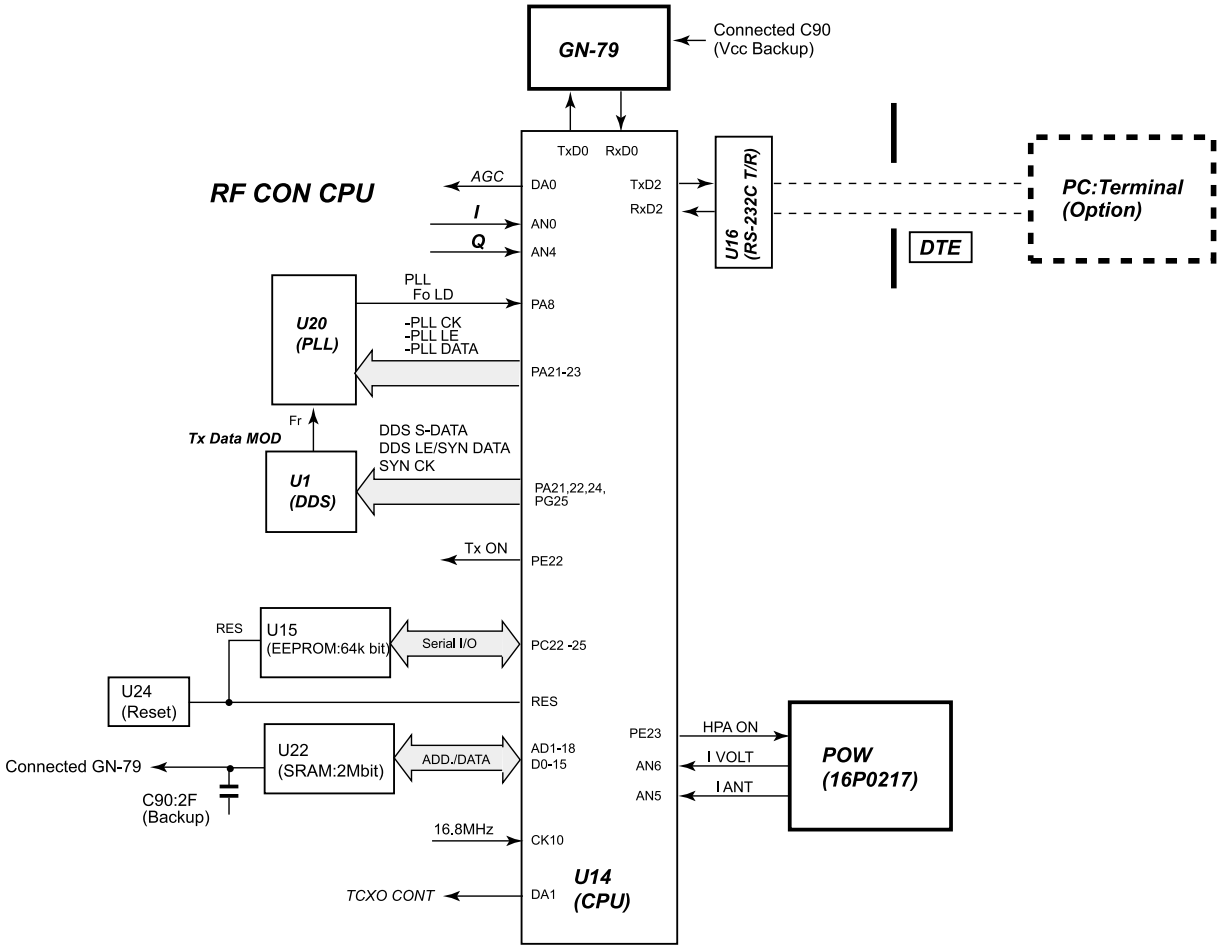


Fig.2.3.3 Block diagram of CPU circuit

3) Memory circuit

EEPROM (8 kbytes) and SRAM (256 kbytes) are connected to CPU. SRAM is backupped by C90 (2.2 F) super capacitor for 72 hours. Table 2.3.1 lists memory ICs on RF CON/PU board.

Table 2.3.1 Memory chips on RF CON/CPU board

Parts number	Function	Type	Memory capacity	Remarks
U14	CPU	HD64F7065A	256 kbytes	Built-in ROM
			8 kbytes	Built-in RAM
U15	EEPROM	CAT25C64P	64 kbits	
U22	S-RAM	CY62146VLL	256 kbytes	Capacitor backup

Forward and Return ID, DNID (Data Network ID) and ENID (EGC Network ID) are written onto EEPROM (U15) at the factory. This IC is removed from the original board and put it onto the replacement board.

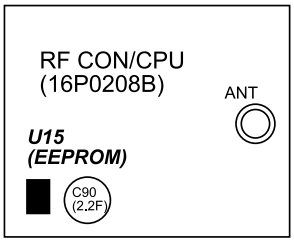


Fig.2.3.4 Location of EEROM on RF CON/CPU board

Forward/Return ID

Each MES has a unique pair of forward and return MES identifies, each of which comprises a 6-character hexadecimal number. Forward ID is used in the To-mobile direction and Return ID in the From-mobile direction in the communication unit between MES and LES. The unique ID pair or Forward/Return ID (2x3 bytes) is permanently memorized onto EEPROM.

DNID

The Data Reporting Service is designed for the efficient transmission of small quantities of data (max. 32 bytes). Data reports are transmitted via signaling channels which are part of the Inmarsat-C network. Data reports can be sent to PSDN, PSTN (data or fax), SAT.400 (E-mail) or telex subscribers.

The Data Reporting Service can be used when you are registered with a data Network ID (DNID).

Once the application form has been processed, the provider will contact you to coordinate the downloading of the DNID. The downloaded DNID, 2 bytes, is memorized onto EEPROM and appears in Data Network ID ([F5][3]).

ENID

To access the Fleet NET broadcast service, a group number called ENID identifier (EGC Network ID), will need to be downloaded. Once downloaded, a message is sent to the ENID on an ocean region basis and all units programmed with the ENID will receive the message.

The downloaded ENID, 2 bytes is memorized onto EEPROM and appears in EGC Network ID List ([F4][2]).

Table 2.3.2 lists contents of each memory.

Table 2.3.2 Memory contents

Contents		RF CON/CPU board (16P208A)			PC (terminal unit)
		U14 (CPU)	U15 (EEPROM)	U22 (S-RAM)	
F4: EGC	1.Display EGC Message				X (32k byte)
	2.EGC Network ID (ENID)		X (64)		
F5: Report	1.Data Report				X (x4)
	2.Message Report				X (x4)
	3.Data Network ID (DNID)		X (64)		
F6: Log	1. Send Message Log				X (Max. 32k, byte: 32 logs)
	2.Reciver Message Log				X (Max. 32k, byte: 32 logs)
	3.EGC Log				X (Max. 32k, byte: 32 logs)
	4.Log				X (50 logs)
F7: Option	5.Ocean Region		X		
	6.LES Information			X	
	7-2.PV Test Result		X		
F8: Setup	1.System Setup		X (Except for IMN)		IMN
	2.Editor Setup				X
	3.Terminal Setup				X
	4.EGC Setup		X		
	5.Auto Mode Setup				X
	6.E-Mail Setup				X
	7.Directories				
	8-1.Station List				X (99 stations)
	8-2.LES List				X (44 stations x4)
	8-3.EGC Channel List		X (4ch x4)		
	8-4.NCS Channel List		X (20ch x4)		
	8-5.E-Mail Service List				X
Forward/Return ID			X		
RF CON/CPU Program		X			
Terminal Program					X
Internal GPS				X	

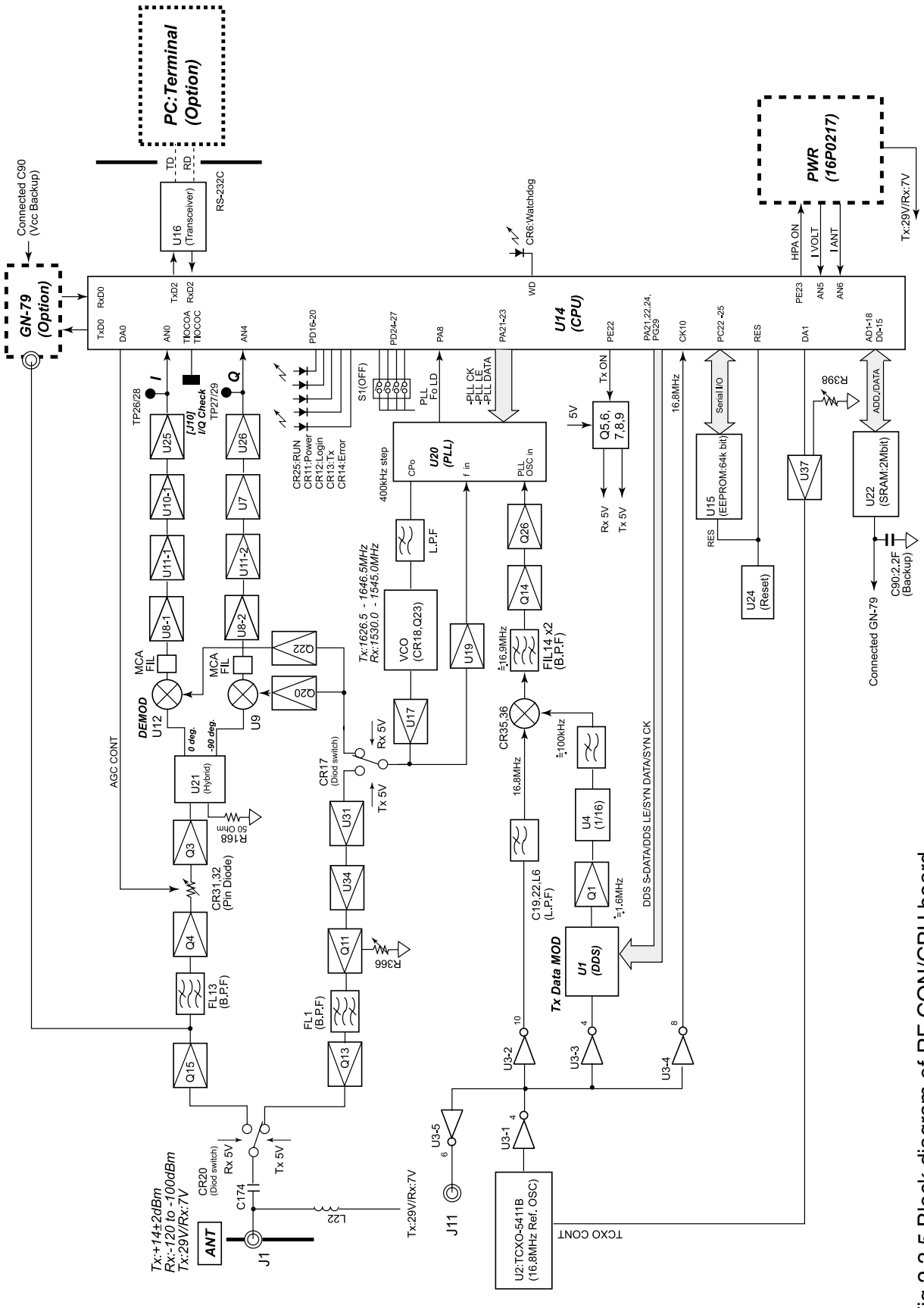


Fig.2.3.5 Block diagram of RF CON/CPU board

2.3.2 Receiving circuit of RF CON/CPU board

The receiving circuit on RF CON/CPU board receives 1.5 GHz RF signal from the antenna unit via switching diode, CR20.
BPSK modulated RF signal is down-converted to 1.2 kHz Intermediate Frequency by Hybrid IC (U21) and DBMs (Double Balanced Modulator, U12 and U9). U9 outputs spread Q-signal and U12 spread I-signal. Demodulated signals are sent to CPU, U14. The DBM receives local oscillator signal 1.2 kHz lower than receiving signal.
To prevent Inmarsat signal from being interfered with Multi-Channel Access (MCA) signal, 1513 to 1525 MHz, IF signal from U9 and U12 passes through a L-C lowpass filter, of which bandwidth is about 5 MHz.

I/Q BPSK Lissajous waveform is observed at J10. See page 5-11 for details. CPU generates AGC control signal by using I- and Q-signals to control PIN diodes CR31 and CR32. NCS/LES TDM channel signal is processed by U14 in the following process and then sent to the terminal unit: BPSK-demodulation, Detecting unique word (frame synchronization), depermuting, deinterleaving, viterbi decoding, descrambling and packet retrieving.

Fig.2.3.6 shows the block diagram of receiving circuit on RF CON/CPU board.

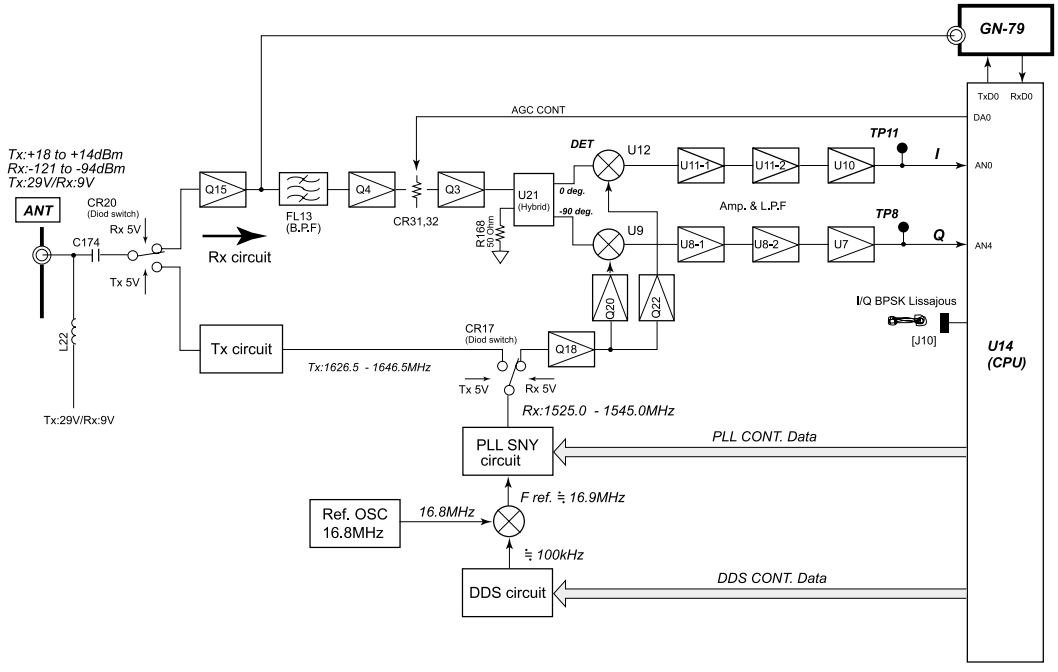


Fig.2.3.6 Block diagram of receiving circuit on RF CON/CPU board

Frequency tracking

Fig.2.3.7 is the block diagram of frequency tracking circuit on RF CON/CPU board. The more the frequency deviation of local oscillator signal, the more the error rate. U14 detects phase shift of I- and Q-signals, and controls the PPL synthesizer accordingly to decrease the error. The frequency of the reference oscillator is adjusted by the first Fast Fourier Transform (FFT) in steps of 1 kHz. Offset value is indicated as "REF Offset Freq." in the Status display. This value should be 150 Hz or less.

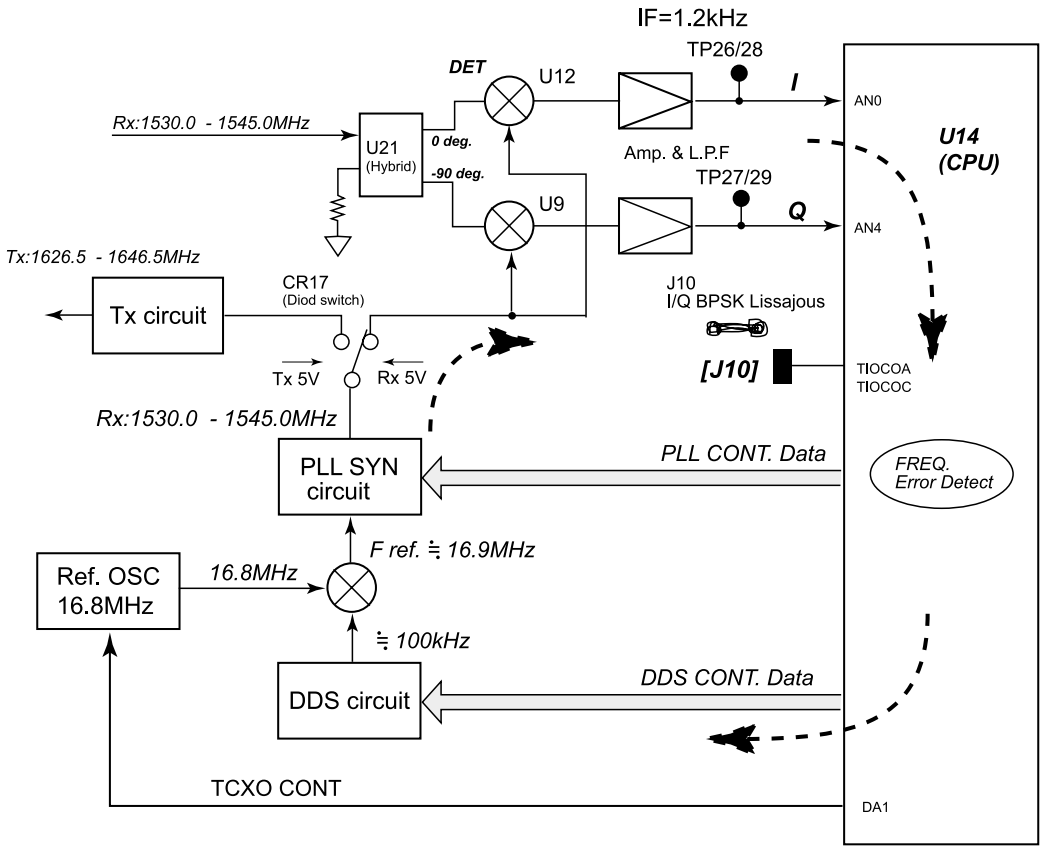


Fig.2.3.7 Block diagram of frequency tracking circuit on RF CON/CPU board

2.3.3 Transmitting circuit of RF CON/CPU board

Transmission is performed in different steps according to the signal type to be transmitted.

1) Messages using MES signaling channel
   Message => Scrambling => Convolutional encoding => Adding unique word => BPSK modulating

2) Messages using MES message channel
   Message => Scrambling => Convolutional encoding => Adding unique word => Interleaving => Permuting encoder => Adding pre-ambling => BPSK modulating

3) Messages using NCS/CES TDM channel
   Message => Scrambling => Convolutional encoding => Adding unique word => Interleaving => Per-muting encoder => BPSK modulating

Data to be transmitted is processed digitally by U14 (CPU), named as “DDS S-DATA”, and sent to Direct Digital Synthesizer (DDS), U1. The data is BPSK-modulated by U1, mixed with 16.0 MHz signal, and sent to the phase lock loop (PLL), U20. An RF signal in the specified frequency, generated by the PLL, is amplified up to +14 dBm and delivered to the ANT connector.

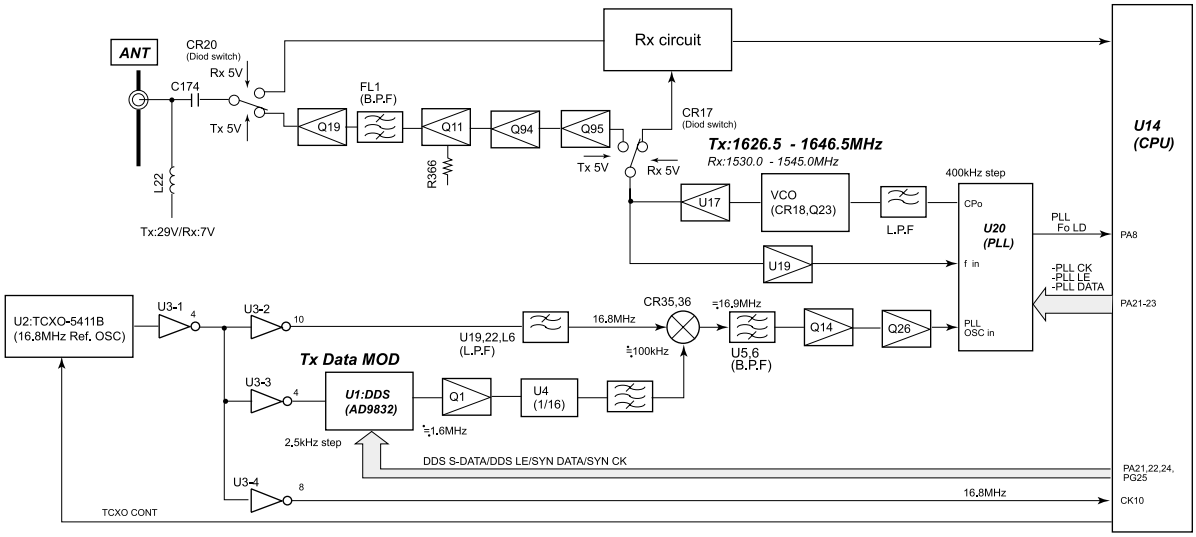


Fig.2.3.8 Block diagram of transmission circuit on RF CON/CPU board

DDS and PLL circuits

Fig.2.3.9 shows the block diagram of DDS, of which output is about 1.6 MHz, BPSK modulated signal.

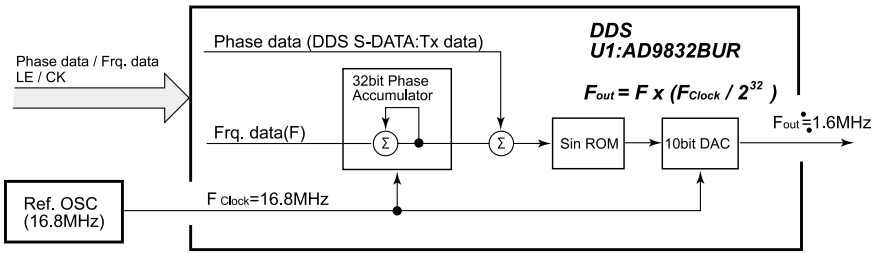


Fig.2.3.9 Block diagram of DDS

U4 divides the signal by 16 to generate about 100 kHz signal. About 100 kHz signal is mixed with the output of the reference oscillator, 16.8 MHz to generate about 16.9 MHz. This signal is input to “PLL OSC in” pin of U20, and then divided by 42. Thus, the PLL synthesizer generates the output signal in a step of 400 kHz.

Fig.2.3.10 shows the block diagram of PLL.

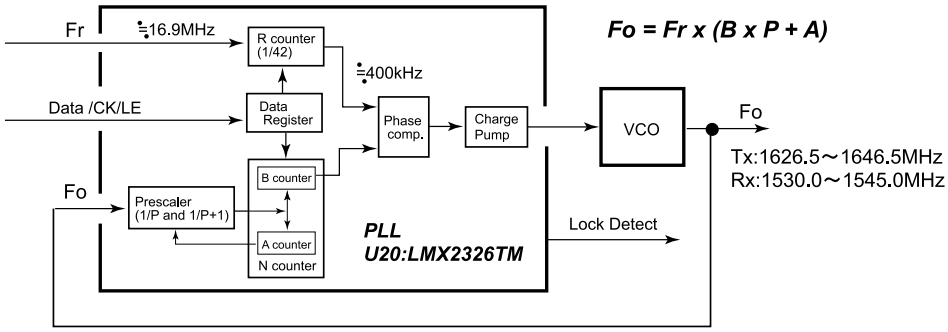


Fig.2.3.10 Block diagram of PLL

Fig.2.3.11 shows frequency steps of PLL and DDS.

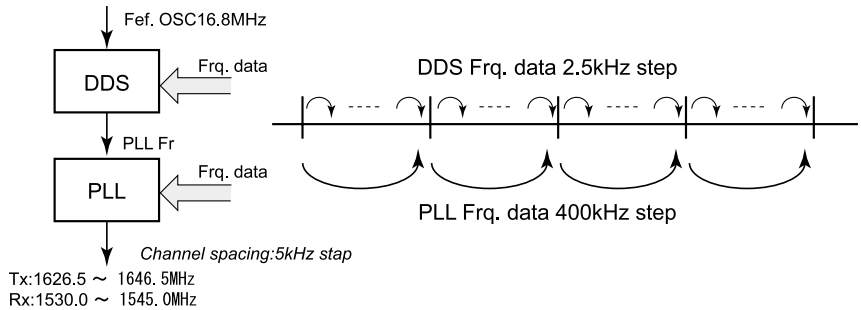


Fig.2.3.11 Frequency step of PLL and DDS

2.3.4 PWR board (16P0217)

On the PWR board, the switching regulator, operating from 10.8 V to 31.2 V, outputs +29 V/+7 V, +6.5 V and +3.3 V. +29 V is supplied to the antenna unit when transmitting and +7 V when receiving. HPA ON signal from RF CON/CPU board selects +29 V or +7 V. Fig.2.3.12 shows the block diagram of the PWR board.

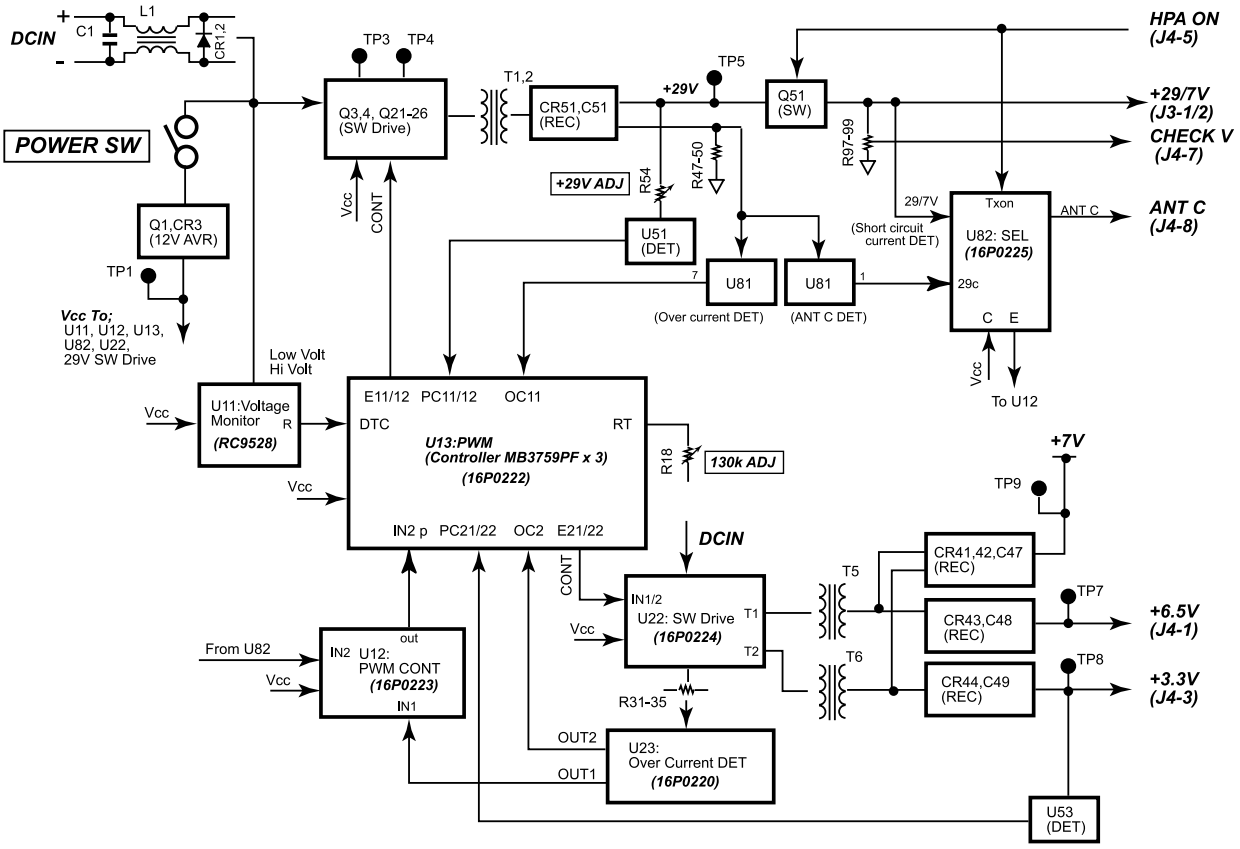


Fig.2.3.12 Block diagram of PW board

The power supply circuit provides following protection circuits.

Protector	Remarks
1) Reverse polarity connection protector	CR1 and CR2 blow in-line fuse.
2) Over-current protector	Automatically resets
3) Short-circuit protector	Manually resets (restart)
4) Input low-voltage protector	Operating voltage: about 8 V
5) Input over-voltage protector	Operating voltage: about 34 V

Status monitoring signals

The board generates following status monitoring signals.

- CHECK V : “Antenna Power Supply” voltage
- ANT C : ANTenna Current (Not used)

Fig.2.3.13 is the block diagram of U11, low- and over-voltage protector.

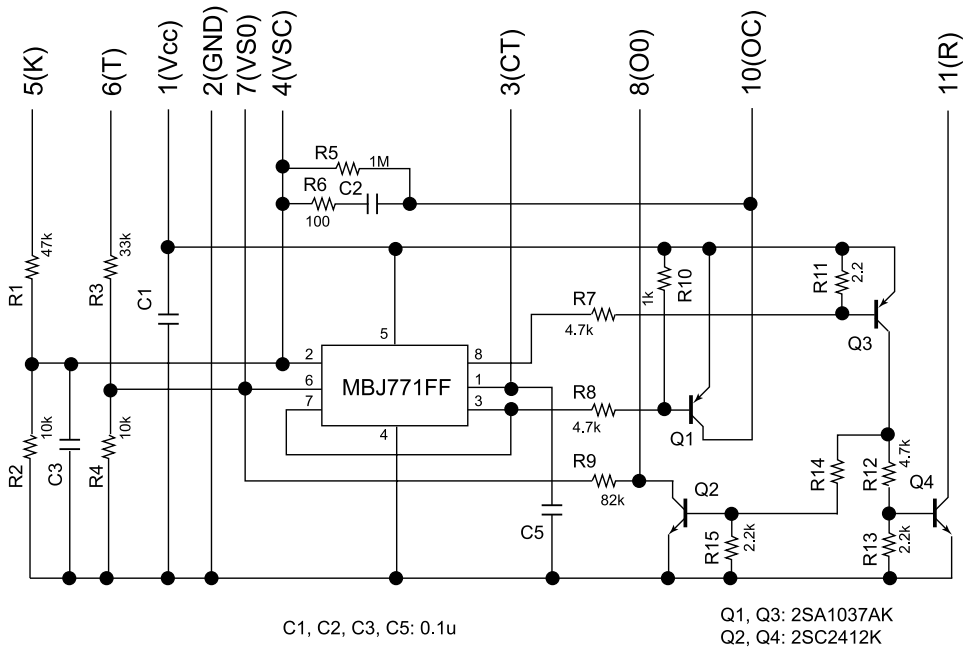


Fig.2.3.13 Block diagram of HIC (RC9528)

2.3.5 Communication between units

The terminal unit (PC) communicates with the communication unit via RS-232C, Asynchronous interface.

RS-232C specifications

Baudrate: 4800 bps
Data length: 8 bits
Stop bit: 1 bit
Parity: ODD
Flow control: Yes
Hand Shake: None (except for TX/RX data)

The terminal unit (PC) sends a command and receives the response signal to/from the CPU on the RF CON/CPU board.
The command is sent twice and ***"No response from Communication unit"*** message appears without the response signal.

Commands from terminal unit (PC) to communication unit

A command is output from the terminal unit to the communication unit when following key operation is made.

1) F8-8-3 to change EGC channel (The channel data is saved in the memory on the RF CON/CPU board. As of July, 2003, EGC service uses one Inmarsat channel per ocean region.)
2) F10 to stop alarm sound
3) F3 for transmission
4) F7-1 to login
5) F7-2 to logout
6) F7-3 to abort, transmission and receiving
7) Forced clear operation (F7-3 and F3-2)
8) F3-1 (START/YES) to start transmitting message
9) F7-7-1 (PV Test)
10) F3-2 to cancel TX message (Pending, Rejected, Fail or Waiting message is deleted from the screen and the memory space occupied by the message becomes free.)
11) F3-3 (Request Delivery Status)
12) F7-4 (Select NCS)
13) F7-5 (Ocean Region)
14) F6-2 and F6-3 (Receive Message Log and EGC Log)
15) F5-1 (Data Report)
16) F7-7-3 (Diagnostics test)

Information from communication unit to terminal unit (PC)

Following information is sent from the communication unit to the terminal unit (PC).
1) Network information (F7-6)
2) Current Channel type in use (NCSCC, LES TDM, MES Sig.CH, MES Msg.CH and Retuning)
3) Description of RX message (LES ID, Date, Priority, Size, Msg. Refe. No,.Sub Add.)

4) EGC message (for transferring)
5) Login/logout status
6) TDM Bulletin Board and SCD (signaling channel descriptor) information.
7) Number of RX message memorized on RF CON/CPU board.
8) BBER value (Every 8.64 seconds to update BBER in Status display)
9) Current TDM information (Not Synchronized, NCSCC, LES TDM, Joint NCSCC and TDM, and ST-BY NCSCC)
10) LES information to update LES in Status display
11) PV Test result
12) Result of the message transmission (F6-1). (Sending, Success, Failed, Rejected, Pending, Unknown)
13) Message delivery status (F3-3). (Msg. Refe No., Status, Attempts, Failure Code and Add.)
14) MES status (The information appears at the bottom of the screen.)
15) Position data (Position data will blink on the screen if data is not updated for 4 hours.)
16) Self Status data (BBER, C/N, Send Level, RX AGC Level, REF Offset Freq., Syhnthe Local, Antenna Power Supply, updated every 5 seconds.)
17) Self test result
18) Warning command (F5-1)
19) Polling call reception

2.3.6 Handling of NMEA Signal

Nera Min-C is fitted with an built-in GPS receiver, GN-79 to supply position data to RF CON/CPU board. An external GPS receiver cannot be connected to Nera Min-C.

Talker priority (Reference only): GP>TR>LC>LA>DE>OM>II>IN
Sentence priority (Reference only): GGA>RMC>GLL>RMA

Table 2.3.3 Receivable NMEA data

Sentence	Receivable by Nera Mini-C	GPS (GN-79) output	Description
GGA		X	GPS fix data
GLL	X (Ver2.0)	X	Geographic position, L/L
GSV		X	GNSS satellites in view
WPL	X		Waypoint location
VTG	X	X	Course over ground and speed
RMA	X		Recommended minimum specific LOLAN-C data
RMB	X		Recommended minimum navigation information
RMC	X	X	Recommended minimum specific GNSS data
MTW	X		Water temperature
DBT	X		Depth below transducer
BWC	X		Bearing and distance to waypoint
BWR	X		Bearing and distance to waypoint, rhumb line
VDR	X		Set and drift
ZDA		X	Time and date

Specification of GPS receiver, GN-79

- Output : NMEA-0183 Ver.2.3
- Receiving frequency : 1575.42 MHz
- Receiving channel/ tracking: 12 channels/Parallel
- UTC output pulse : 1 pulse/second
- Datum : WGS 84
- Tracking code : C/A code
- Maximum tracking satellite: 12 pcs

Chapter 3. Location of Parts

3.1 Communication unit, IC-216

Fig.3.1.1 Communication unit, front view

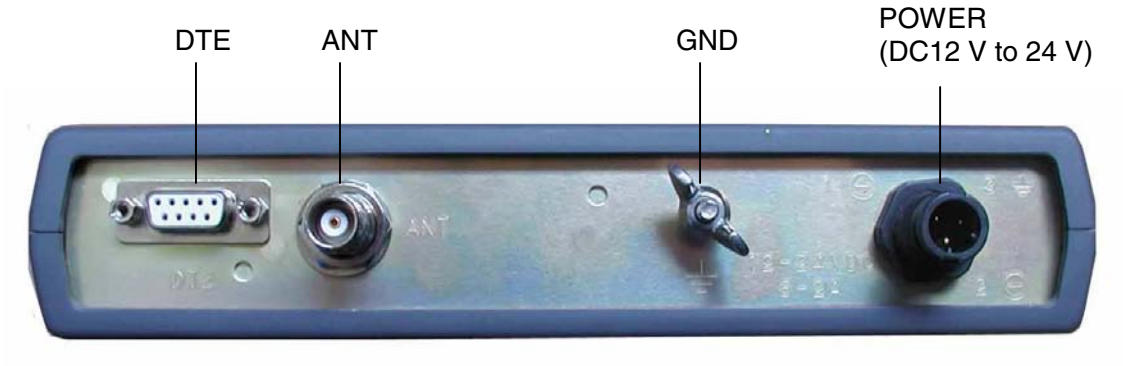


Fig.3.1.2 Communication unit, rear view

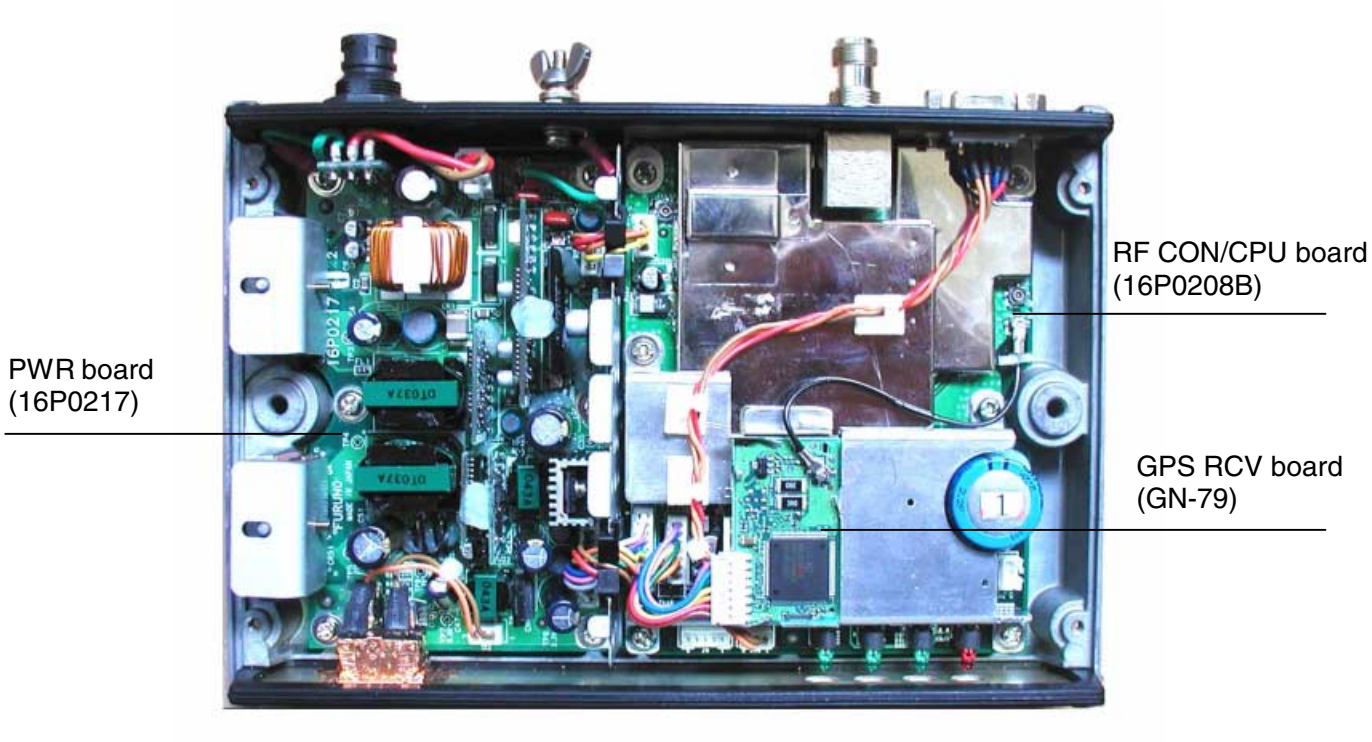


Fig.3.1.3 Communication unit with cover removed

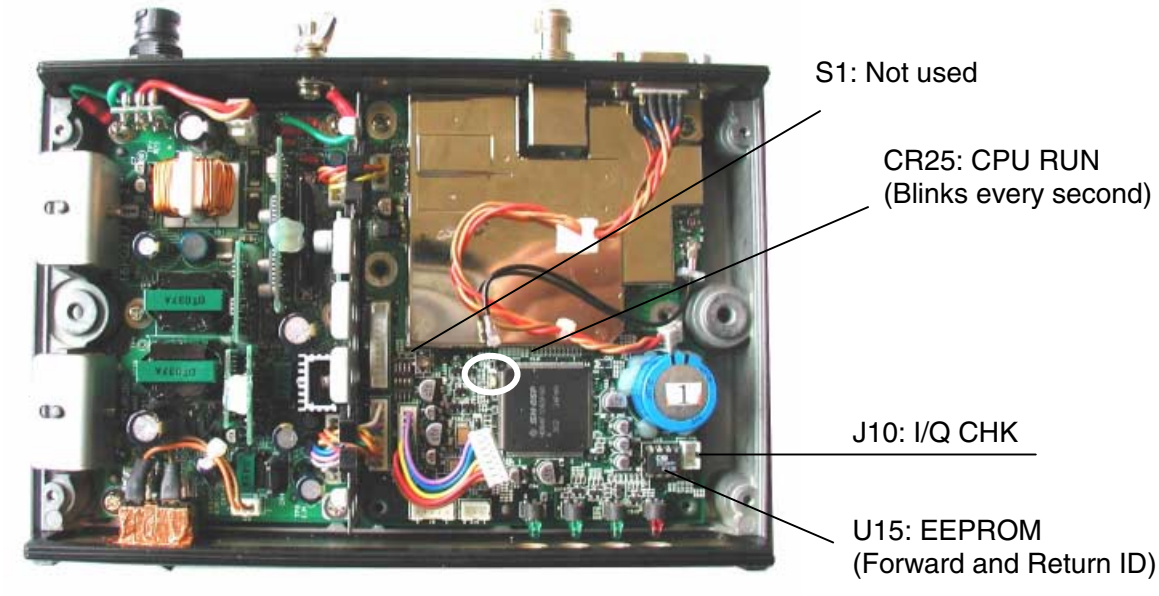


Fig.3.1.4 Communication unit with GPS RCV removed

3.2 Antenna unit, IC-116

Fig.3.2.1 Antenna unit

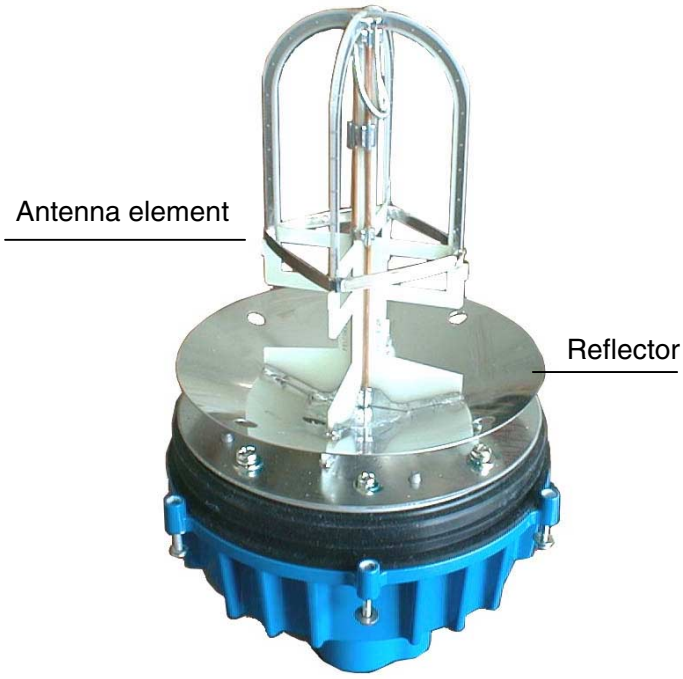


Fig.3.2.2 Antenna unit with cover removed

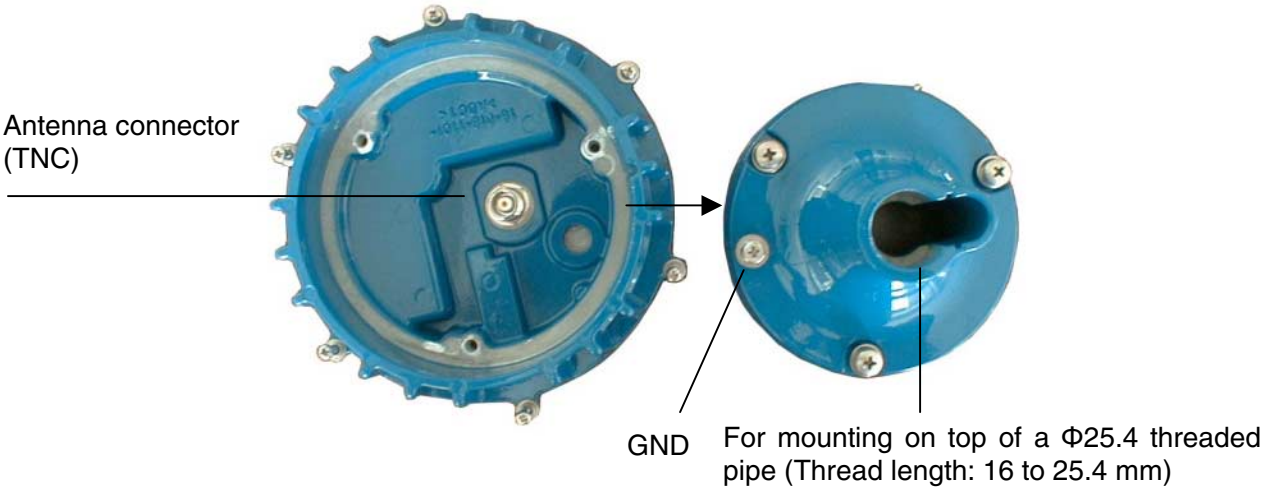


Fig.3.2.3 Antenna unit, bottom view

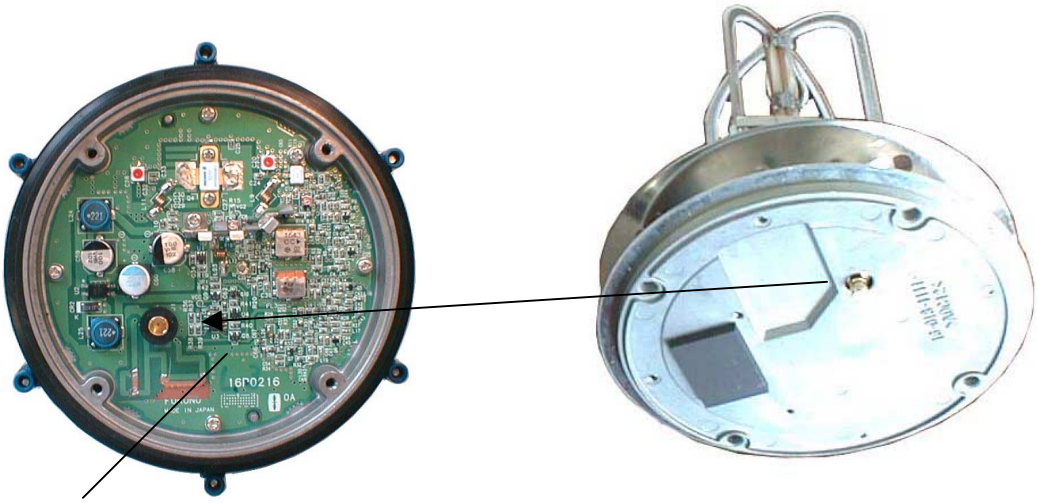


Fig.3.2.4 Antenna unit with antenna element removed

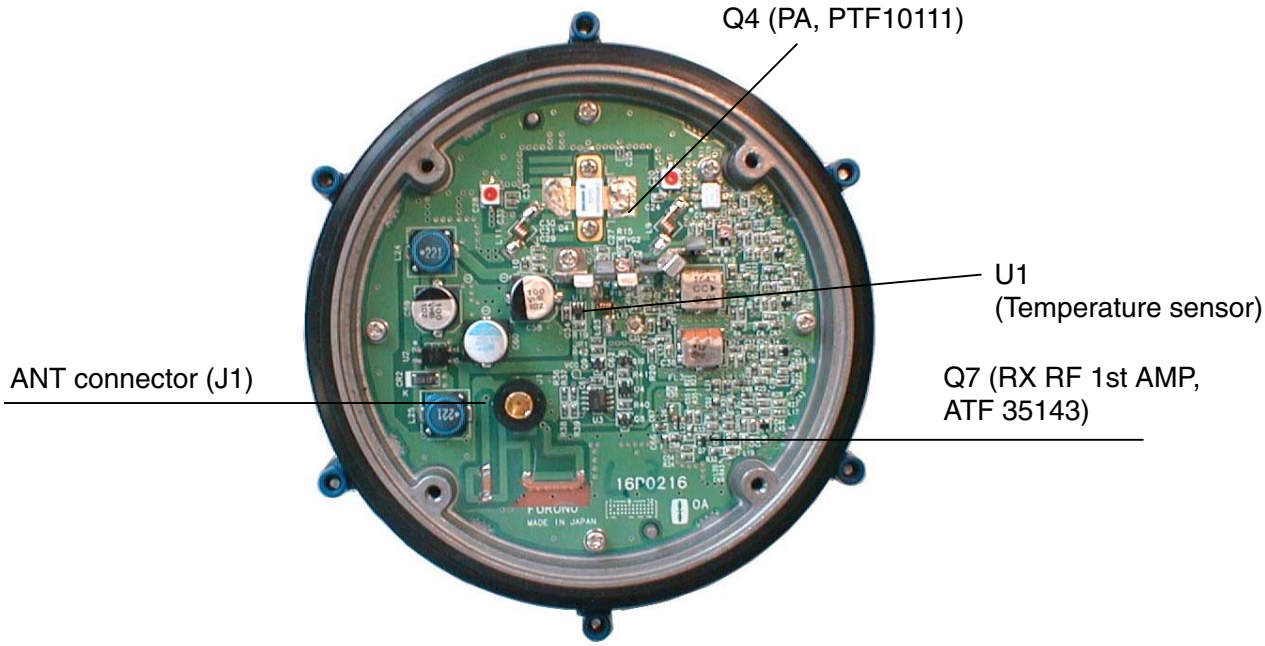


Fig.3.2.5 ANT RF board (16P0216)

4.1 Menu Settings

After installation, Nera Mini-C is set up through System menu. To show System menu, Press [F8] key.

1. System Setup: [F8]-1

Item	Options	Description
System Date & Time		The system uses date and time from the built-in GPS. When date data (ZDA) is not available, the system uses the data manually entered.
IMN		IMN (Inmarsat Mobile Number) is displayed in the status display. To clear IMN, type “IMN” while holding [ALT].
MES Operation Mode	INMARSAT C/EGC	Set to “INMARSAT-C” normally,. INMARSAT C: Message communication and EGC reception (class 2) EGC: EGC reception only
Command Window		Not used. Leave with factory default settings.

Reference only

How to change “Command Window” setting;

1. Select “Command Window” in System Setup menu.
2. Enter “NERASERVICE” onto JOB No. line, followed by [Enter]. Password input line appears.
3. Enter “Nera Mini-C” onto Password line, followed by [Enter].

The command window includes two items as below.

Item	Factory default settings	Remarks
1. Remote Box Setup	1. DMC (ON/OFF)	Unchangeable
	2. IC-305 (ON/OFF)	Unchangeable
	3. 306 No.1 (ON/OFF)	Changeable
	4. 306 No.2 (ON/OFF)	Changeable
	5. 306 No.3 (ON/OFF)	Changeable
2. Internal GPS Setup	1. Data Output Interval (01 – 30 sec)	Changeable

2. Editor Setup: [F8]-2

Item	Options	Description
Text Mode	Telex/Ascii	"Telex": Used when creating a telex message. Only upper case alphabet is permitted in telex. "ASCII": Used when creating an e-mail message. Upper and lower case alphabet may be used in an e-mail. When transmitting, the text converted into the selected code appears in the Transmit message display.
Edit Mode	Insert/Overwrite	"Insert": A character is inserted at cursor position. "Overwrite": A character is written over at cursor position.
Word Wrap	ON/ OFF	Turns on/off automatic hyphenation at the end of a line.
Line No.	ON/OFF	Turns line number display on or off.
Tab Width	2/4/8Char	two, four or eight tabs per line.
Column width	69/40 to 80	"69" for Telex or "40 to 80" for ASCII.
Cursor Type	Block/ Underline	Chooses cursor configuration, "■" or underline.
Scroll	Full/Half Screen	Sets how much the screen moves up over the page (Full screen or Half screen) when [PgUp] or [PgDn] key is pressed.

3. Terminal Setup: [F8]-3

Item	Options	Description
Date Disp. Form	YY - MM - DD	Status display and time stamp use the selected form.
	MMM - DD - YY	
	DD - MMM - YY	
Currency Unit	SDR/US/EUR/ YEN/OTHER	The unit of the communication charge shown in the Transmit Message display (F3-1) is selected.
Screen Saver	ON/OFF	When set to ON, the screen saver is in active if the terminal unit is not used for 10 minutes.
Window Color	Window Color Setup	Selects window color.
	Default Color	Selects default window color.

4. EGC Setup: [F8]-4

Item	Settings	Description
Receive EGC Area	Additional Position	Selects the message by L/L, instead of ship's position.
	Navarea	Selects message by Navarea.
	Fixed Area	Used to enter fixed areas (max. 3) for chart correction service. However, this service is not yet available.
NAVTEX	Station Code	Selects NAVTEX station.
	Type of message (Ice Report to QRU)	Selects message type.

5. Auto Mode Setup: [F8]-5

Item	Options/Settings	Description
Auto Log Print	ON/OFF	Selects whether log is automatically printed out every 00:00 o'clock, once a day or not.
Receive Alarm	ON /OFF	Selects whether the built-in speaker of the PC is activated or not when the message is received. The sound level is set on the PC.
Auto Receive Message Save	ON/OFF	Selects whether the message is saved automatically or not.
Auto Receive Message Print	ON/OFF	Selects whether the message is printed out or not.
Data Report & Polling Print	ON/OFF	Selects whether data report and polling data are printed out or not.
Auto EGC Message Save	System	Selects the message type to be saved automatically. The keystroke of [F8][7] selects the drive and directory where the message is saved. If no directory is specified, the message is saved onto the Mini-C PC application holder on hard disk (drive C).
	Fleet NET	
	Safety NET (Rou.)	
	Safety NET (Saf.)	
	Safety NET (Urg./Dis.)	
Auto EGC Message Print	System	Selects message type to be printed out automatically. Urgent and Distress messages are always printed out regardless of menu setting. When "Safety NET (Saf)" is set to OFF in "Auto EGC Message Save", "Safety NET (Saf.)" in Auto EGC Message print is set to ON.
	Fleet NET	
	Safety NET (Rou.)	
	Safety NET (Saf.)	

6. E-mail Setup: [F8]-6

Item	Settings	Description
Select station		Only selected LES are used when a message is transmitted via Transmit Message menu ([F3][1]).

7. Directories: [F8]-7

Item	Settings	Description
Message Directory	Select Directory	To create and select the directory, where the received message is saved; 1. Select the directory. 2. Press [↓]. 3. Press [Insert]. 4. Enter the directory name. 5. Press [Enter]. 6. Press [↑]. 7. Press [Enter] and then select the directory. 8. Press [ESC] to return the status display.
EGC Message Directory	Select Directory	

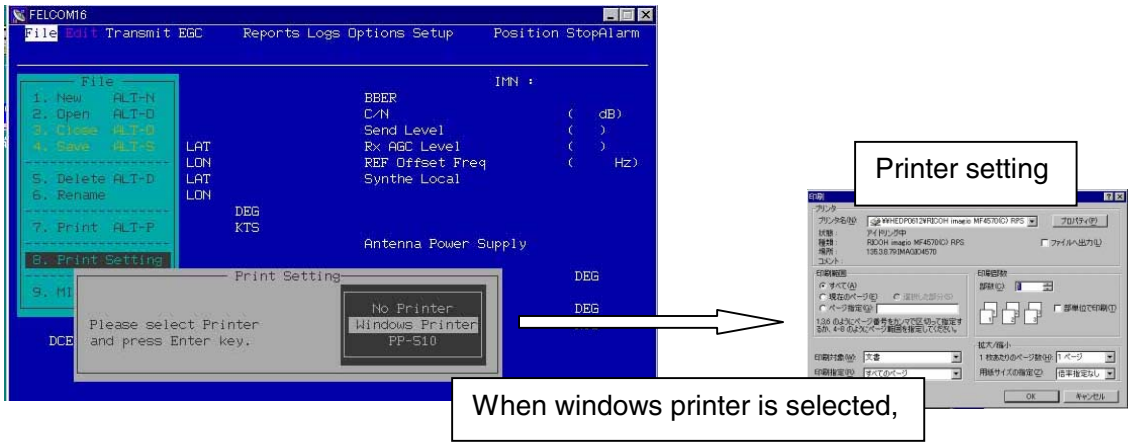
8. Configuration: [F8]-8

Item	Settings	Description
1. Station List *(Max.99 stations)*	Station Group	For making a group of stations
	Station Name	To delete a station, press [Backspace] to erase station name, and then press [Enter].
	Destination Type	Connection type
	Prefix code	
	Country/Ocean Code	
	Station ID	
	Modem Type	
	E-mail Address	
	Remark	
2. LES List *(Max. 44 stations x 4)*	Name	To delete a station, press [Backspace] to erase name, and then press [Enter].
	ID	
	Remark	
	Charge	
3. EGC Channel List	Max. 4ch x 4	For new common channels
4. NCS Channel List	Max. 20ch x 4	
5. E-mail Service List *(Max. 16 stations)*	Service Station Name	LES name where E-mail service is available.
	Service ID	Up to 9 characters EX) Comsat: INET, Station12: 400
	LES ID	
	To:	Creating a header
	Cc:	
	Subject:	
	Separator	
	Attach File (MIME: Multi-purpose Internet Mail Extension)	Selects an attachment format. Options: OFF, BASE64 and UUENCODE UUENCODE : normal setting ***When setting to OFF, attachment file cannot send.***
6. Save/Load	Save to FD	See page 5-16.
	Load from FD	

4.2 Print Setting: [F1]-8

Printer type is selected through this menu.

- No printer : When the printer is not connected or to stop printing out.
- PP-510 : When PP-510 is connected.
- Windows Printer : When commercial printer is connected. Printer type is selected from pull-down menu.



4.3 PR-240 power alteration

PR-240 is shipped for 220 VAC power connection. The power alteration between 220 V and 115 V is made by changing wire connection.

Step 1. Change tap connection.

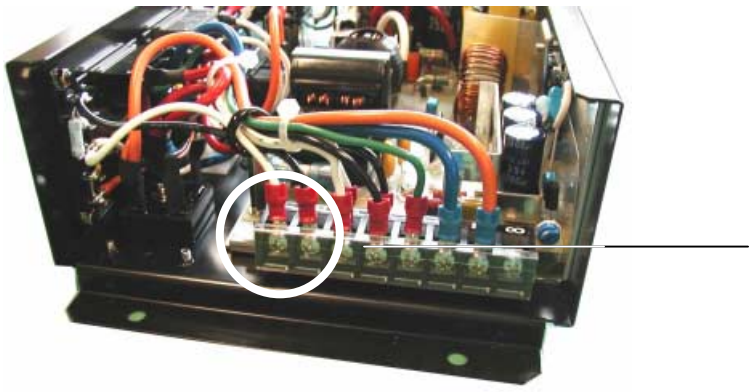
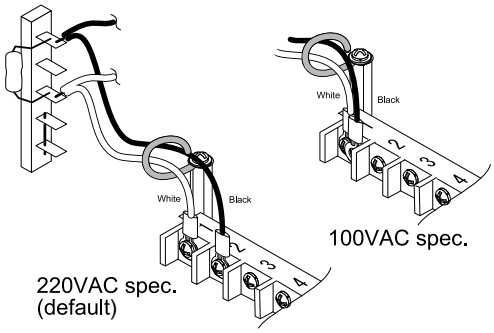
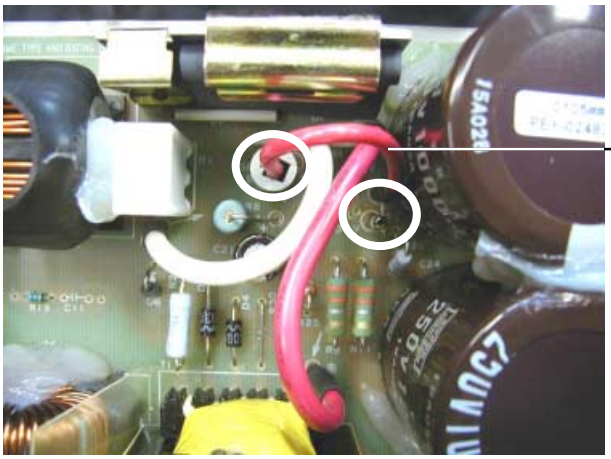


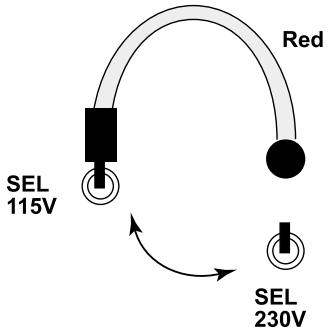
Fig. 4.2.1 Changing tap connection



White and black wires are connected to #1 and #2 respectively in 220 VAC sets. Both wires are connected to #1 in 115 VAC sets.

Step 2. Change jumper connection





Change the connection of red wire depending on ship's mains.

Fig. 4.2.2 Changing jumper connection

Chapter 5. Maintenance

5.1 Performance Verification (PV) test

The PV test is known as the link test to test the MES. The test is performed in conjunction with an Inmarsat-C LES, but the operator does not need to select an LES for this purpose.

5.1.1 PV test sequence

The PV test is carried out in the following steps when PV test on the test menu is selected.

1. The MES requests a test by sending a test request to the NCS.
2. The NCS acknowledges the request for testing.
3. Upon receiving acknowledgement from NCS, the MES goes into “pending” mode.
4. The NCS selects an LES not busy to perform the test.
5. The LES transmits a test message to the MES.
6. The MES transmits the test message to the designated LES.
7. The MES is prompted to initiate a test distress alert. The MES issues a test alert 2 minutes after the reception of the prompt.
8. On successful completion of the tests, the LES sends confirmation to the MES.

5.1.2 PV test Procedure

To initiate PV test;

1. Make sure that;
   1) The system is logged-in.
   2) The Current Status in the Status display is “IDLE”.
   3) The C/N in the Status display is “OK”.

2. Open PV test menu by pressing [F7 (Option)], [7] and then [1].

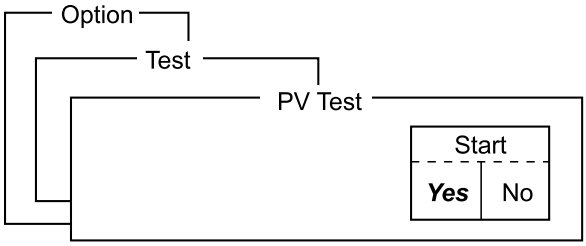


Fig.5.1.1 PV Test start Yes/No display

3. Select “Yes” and then press [Enter].

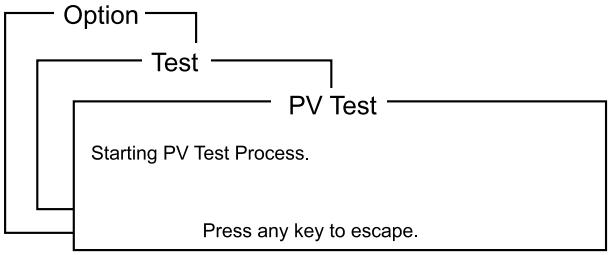


Fig.5.1.2 PV Test start display

4. PV test starts. In the Current Status line, PENDING appears when the acknowledgement is received from the NCS and then TESTING when the test commences.

5. After completing the test, the Current Status line changes to “IDLE”.

6. Check the PV test result, automatically printed out.

How to check PV test result

Fig.5.1.3 shows PV Test result. To show the last PV Test Result display, press [F7/Option], [7] and then [2]. The test result on the screen is printed out by pressing [P] while holding [Ctrl].

PV Test Result

Ctrl + P : Print ESC : Quit

Test Date & Time	02-01-01 01:00 (UTC)
Attempts	First attempt
BBER	Pass
Shore - to - Ship Attempts	First attempt
Ship - to - Shore Attempts	First attempt
Distress Alert	Pass (Test OK)
Signal strength	Pass (Greater than Std level + 6dB)
Overall Result	Pass (Applicable tests pass)

Fig.5.1.3 PV Test result display

- Test Date & Time : Date and Time when PV test is performed.

- Attempts : Number of the attempt from the last successful PV test.

- BBER : When Bulletin Board Error Rate (BBER) is low (high), "Pass" ("Fail") appears.

- Shore to Ship Attempts : Number of the test initiated by LES to receive the response from MES.
  Results: First attempt, Second attempt, Third attempt, Third attempt failed

- Ship to Shore Attempts : Number of the test initiated by MES to receive the response from LES
  Results: First attempt, Second attempt, Third attempt, Third attempt failed

- Distress Alert : Result of distress alert transmission test.
  Pass (Not Applicable, Test OK, Nature of Distress: not Default, Null Data, or Automatically Activated)
  Fail (No Response, Incorrect Protocol, or Invalid Data Format)

- Signal Strength : Signal strength of the test message received by the LES.
  Pass (Less than Std. Level, Greater than or equal to Std. Level, Greater than Std level +3, +6, +10, +13, or +16 dB)
  Fail (No response or unreadable)

- Overall Result : Overall result of the PV test.
  Pass (Applicable tests pass)
  Fail (Forward message transfer fail, Return message transfer fail, Signal unreadable, Signal level excessive, Distress alert test fail, or Unspecified fail)

5.2 Selftest

The system provides;

1) Power-on selftest
2) Selftest through menu
3) Circuits which monitor Synthesizer Unlock status and power supply to antenna

5.2.1 Power-on Selftest

Table 5.2.1 summarizes the power-on selftest.

Table 5.2.1 Power-on selftest

Test item	Parts to be tested	Error message
SRAM Read/Write check	U22 on RF CON/CPU board	TROUBLE: RFCON CPU RAM NG.
Read/Write check for CPU with built-in ROM	U14 on RF CON/CPU board	TROUBLE: RFCON CPU ROM NG.

5.2.2 Selftest from menu

To perform the selftest, follow the procedure below.

1. Press [F7/Option], [7] and then [3] to show the Diagnostic Test menu.

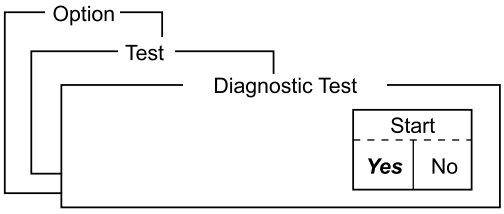


Fig.5.2.1 Diagnostic Test

2. Select “Yes” and then press [Enter]. The test starts and “Now testing” appears. Fig.5.2.2 shows the test result.

Terminal version appears even if Communication unit is not connected.

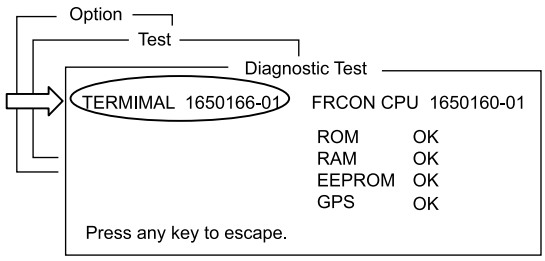


Fig.5.2.2 Test result display

3. Press [Esc] to escape from Test mode.

5.2.3 “TROUBLE” messages

Table 5.2.2 lists “trouble” messages.

Table 5.2.2 “TROUBLE” message

Message	Description	Action
TROUBLE: RFCON CPU ROM NG.	ROM read/write test failure (Detect ROM error at power on selftest and diagnostic test.)	Change RF CON/CPU board.
TROUBLE: RFCON CPU RAM NG.	RAM read/write test failure (Detect RAM error at power on selftest and diagnostic test.)	
TROUBLE: RFCON CPU EEPROM NG.	EEPROM test failure (Detect EEPROM error at power on selftest and diagnostic test.)	1) Change EEPROM (U15*). 2) Change RF CON/CPU board.
TROUBLE: Synthesizer UNLOCK.	PLL synthesizer on RF CON/CPU board unlocks.	Change RF CON/CPU board.
TROUBLE: ANT power voltage abnormality.	Supply voltage to the antenna (Tx29 V/Rx7 V) is not within ratings.	1) Check antenna coaxial cable. 2) Change antenna unit. 3) Change PWR board.
TROUBLE: EEPROM ERROR.	Data cannot be written onto EEPROM. Data includes ID, DNID, ENID [F7]-5-7.2, [F8]-1-4, 8-3 and 8-4.	1) Change EEPROM (U15*). 2) Change RF CON/CPU board.
TROUBLE: Invalid MES ID, This equipment is defected. Please contact Nera SatCom.	Forward and Return ID memorized on EEPRPOM (U15) on RF CON/CPU board is invalid or erased.	Change EEPROM (U15).
TROUBLE: Carrier power level.	Transmitting output power error	Not used
TROUBLE: GPS module	Defective built-in GPS receiver.	Change GPS.

*: EEPROM (U15) on RF CON/CPU board maintains MES ID (Forward ID and Return ID). Always quote the serial number of the communication unit when ordering the EEPROM. MES ID differs from set to set.

5.3 Status monitor display

Fig.5.3.1 shows the status monitor display.

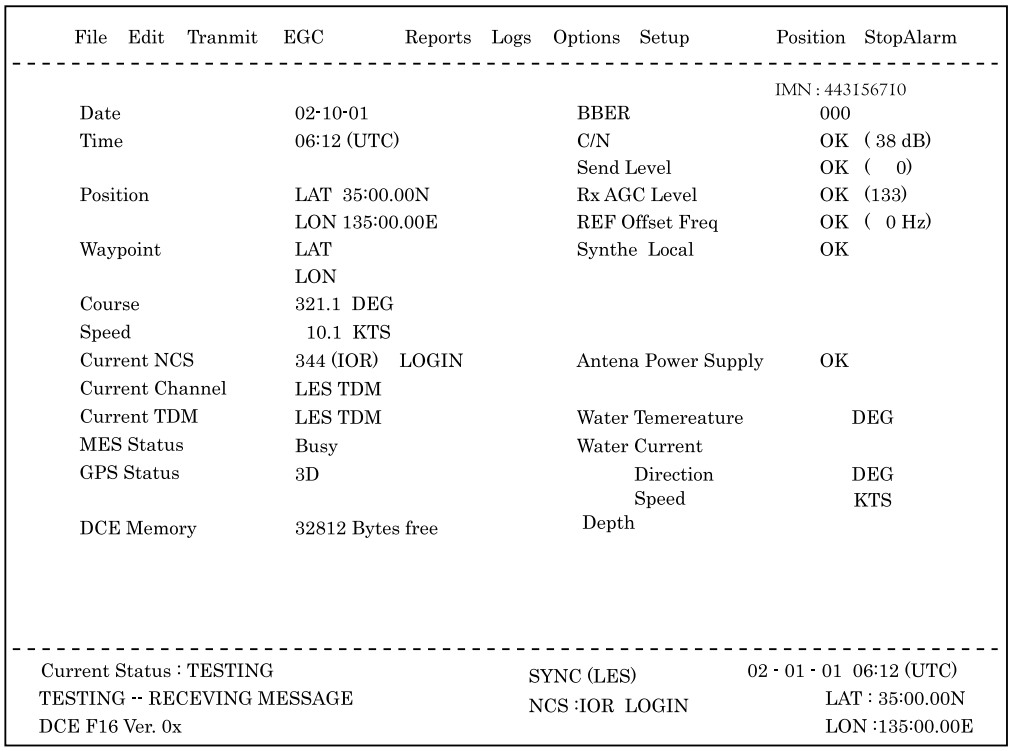


Fig.5.3.1 Status monitor display

- Date : Current date (based on ZDA)
- Time : Current time calculated from the frame number of NCS TDM.
- Position : Own ship’s position (either GPS or manually entered position)
- Waypoint : Not used
- Course : Ship’s heading (VTG)
- Speed : Ship speed (VTG)
- Current NCS : NCS in use
- Current Channel : Channel in use (NCS common channel, MES message channel, etc.)
- Current TDM : TDM type (NCS common TDM or LES TDM)
- MES Status : Status of MES (Busy or Idle)

- GPS Status : Status of built-in GPS receiver

  CST (Cold Start): Fixing position without almanac data
  ACQ (Acquired): Acquiring almanac data
  IMP (Impossible): Reception impossible
  INT (Interrupted): GPS reception interrupted
  ALM: Receiving almanac data
  2D, 3D: Position fix mode

- DCE memory : Unused memory in S-RAM on RF CON/CPU board

- BBER : Bulletin Board Error Rate (BBER) is a measure of the number of bulletin board packets received in error out of the last hundred received bulletin board packets. This count is continuously updated frame by frame. The measurement is performed regardless of received channels (LES or NCS TDM) and for every frame received while the receiver is synchronized to a TDM (valid UW). When the error is 80 % or more, “WARNING: BBER over 80%. SCANNING NCS start manually” message appears, indicating that the RX circuit on RF CON/CPU board might be defective.

- C/N : Carrier/Noise means the quality of receiving signal. C/N data is generated by U14 (CPU) based on BPSK demodulated I- and Q-signals on RF CON/CPU board. When the C/N level is 31 dB or more, “OK” appears.

  Parts to be checked when NG
  - Antenna unit
  - Antenna coaxial cable
  - Coaxial connector
  - RX circuit on the RF CON/CPU board
  - Blockage

- Send Level : PWR board detects the current flowing in the antenna cable as the send level. However, the value is fixed to “0” when receiving and “255” when transmitting by software.
  When the following error messages appear at login, the transmitter circuit is defective while the receiving circuit is normal.

  “Too many retries.”
  “MES Signaling Failure, Login Request not sent to NCS.”
  “Login failed.”

  Parts to be checked when NG
  - Antenna unit
  - RF CON/CPU board
  - PWR board

- Rx AGC Level : "OK" appears when the level is 60 or more. When the value is near 255, the receiving signal is not input to RF CON/CPU board from the antenna unit. U14 (CPU) on RF CON/CPU board generates AGC voltage to control pin diodes, CR31 and CR32 based on BPSK modulated I- and Q-signals.

  Parts to be checked when NG
  - Antenna unit
  - RF CON/CPU board.

- REF Offset Freq.: Indicates the offset frequency of the reference oscillator from receiving frequency. "NG" appears when it is 150 Hz or more. The larger the value, the more the error rate. The CPU on RF CON/CPU board detects the offset frequency and the phase shift of and Q-signals. According to the detected value, the output of the DDS (Direct Digital Synthesizer) or the input of the PLL synthesizer changes in frequency. Thus, the system minimizes the offset of the carrier frequency.

- Synthe Local : Indicates the local PLL synthesizer (U20) status; lock or unlock. The CPU on RF CON/CPU board receives PLL unlock signal when the PLL synthesizer circuit unlocks.

  Parts to be checked when NG
  - RF CON/CPU board.

- Antenna Power Supply: Power supply to the antenna unit, TX 29 V/RX 7 V is monitored as "Check V" signal. The voltage is supplied to the CPU on the RF CON/CPU board via the voltage divider formed by R97, R98 and R99.

  Parts to be checked when NG
  - Antenna coaxial cable
  - Antenna unit
  - PWR board

- Water Temperature: Not used

- Water Current
  Direction: Not used
  Speed : Not used

- Depth : Not used

Table 5.3.1 Update interval of each item in status monitor display

Item	Every 30 seconds	Every 30 seconds, or when the value is changed	Every 5 seconds
Date			
Time			
Position	X (Max. 30 sec)		
Waypoint	X (Not used)		
Course	X		
Speed	X		
Current NCS		X	
Current Channel		X	
Current TDM		X	
MES Status		X	
GPS Status		X	
DCE memory		X	
BBER			X
C/N			X
Send Level			X
Rx AGC Level			X
REF Offset Freq.			X
Synthe Local			X
Antenna Power Supply			X
Water Temperature	X (Not used)		
Water Current	X (Not used)		
Depth	X (Not used)		

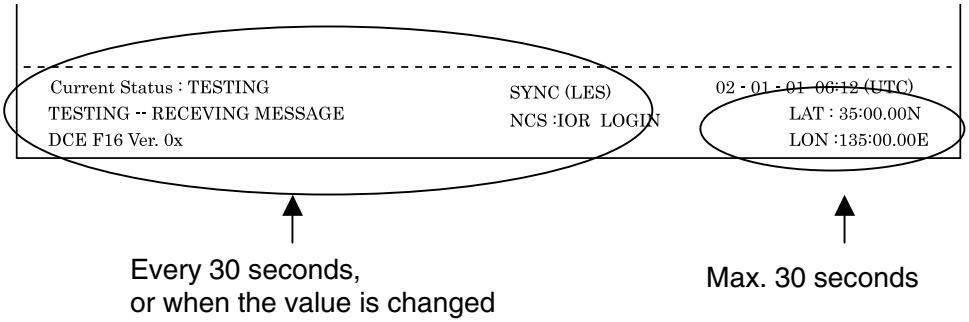


Fig. 5.3.2 Update interval of each item at the bottom of status monitor display

5.4 Observing Received BPSK waveform

Lissajous waveform of processed BPSK signal can be observed at J10 on RF CON/CPU board with a dual trace oscilloscope. Connect probes of CH1 and CH2 to #1 and #2 of J10 respectively. The waveform varies according to signal strength and signal status (synchronized or not synchronized). The Lissajous waveform helps you find a dry joint, a loose pin connection and/or a poor contact.

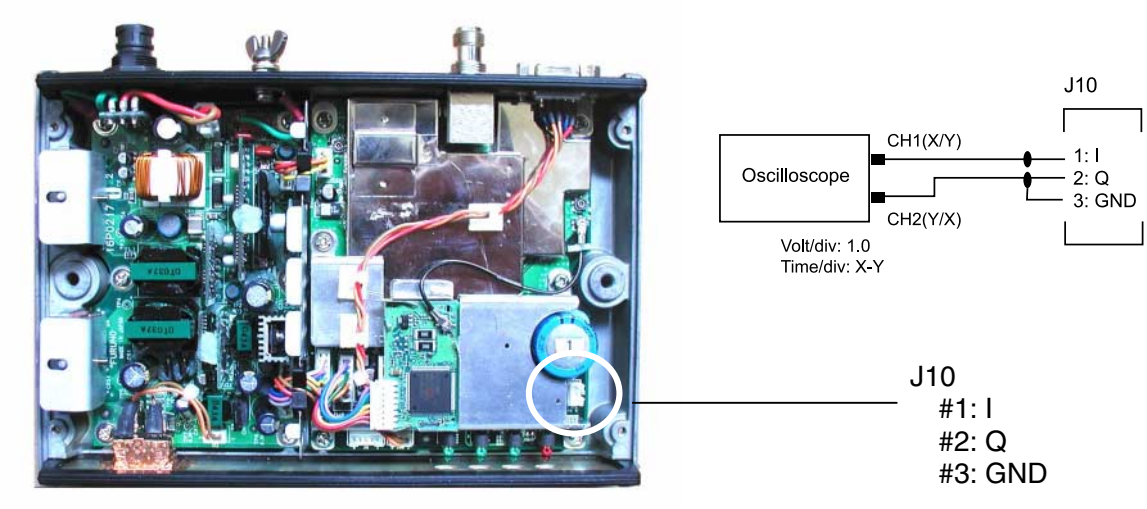
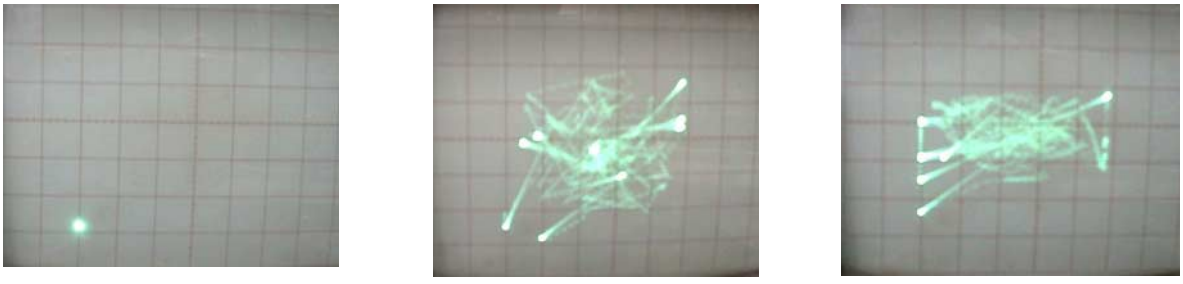


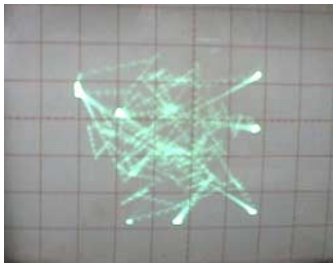
Fig.5.4.1 RF CON/CPU board



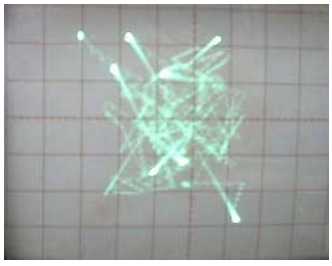
a) Signal searching

b) Small C/N (32)

c) Good C/N (42)



d) Asynchronous



e) Noise

Fig.5.4.2 Lissajous waveform of received BPSK signal on J10

5.5 LED

Fig.5.5.1 shows LEDs on the RF CON/CPU board.

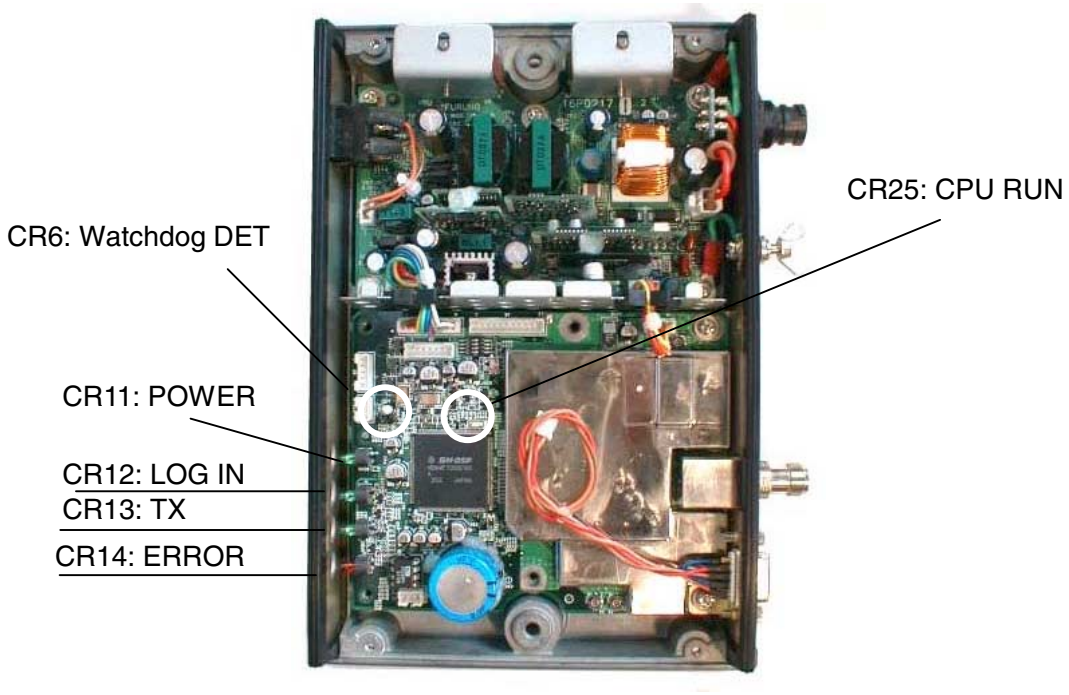


Fig.5.5.1 LEDs on RF CON/CPU board (16P0208B)

Table 5.5.1 LED Function

LED No.	Function	Description
CR6	Watchdog	Lights when an error is detected.
CR11	Power ON/OFF	Lights when the system is powered on.
CR12	Log in	1) Lights when MES is logged in. 2) Blinks when MES is logged out and synchronizes with TDM signal. 3) Goes off when MES does not synchronize with TDM signal.
CR13	TX	Lights during transmission.
CR14	Error	Lights when detecting an error on ROM, RAM, EEPROM, SYN, ANT-C and CHK-V tests.
CR25	CPU RUN	Blinks every second when CPU on RF CON/CPU board runs.

5.6 DIP switch

Fig.5.6.1 shows a DIP switch on the RF CON/CPU board.

Fig.5.6.1 Dip Switch on RFCON/CPU board

Table 5.6.1 lists the function of DIP switch, S1.

Table 5.6.1 Function of DIP switch

Board	S1	Factory default	Function
RFCON/CPU (S1)	#1	OFF	For factory use (Used to write boot program.)
	#2	OFF	Not used
	#3	OFF	
	#4	OFF	For factory use

5.7 Description of LES Information

LES information is downloaded from the NCS automatically at login. To show the "LES Information";

1. Press [F7][6] and then [Enter] to select "LES Information".

Fig.5.7.1 shows LES Information display.

LES Information

LES ID	Name	Status	Services	TDM ch.
201	xxxxxxx	11111000 (B8 ~ B1)	AS----------EL	12345
202				
203				
207				
210				
211				
212				

Fig.5.7.1 LES Information display

- LES ID : LES number

- Name : LES name in LES List ([F8]-9-2). If the name is not registered, no name is displayed.

- Status : The LES status is displayed by a eight digit number. Bits 4 to 8 show LES status as shown in Table 5.7.1.

Table 5.7.1 LES Status

Bit No.	Status	Flag	Description
B8	Return link speed	1	600 bps
		0	300 bps
B7	Operational or spare satellite operation	1	Operational
		0	spare
B6	LES Status	1	In service
		0	Out of service
B5	LES Status	1	clear
		0	congested
B4	Used only by land earth stations	1	Terrestrial links open
		0	Terrestrial links closed
B3-1	Not used	0	

- Services: Table below lists LES services. When the LES supports the service, an alphabet appears

Table 5.7.2 LES Services

Bit No.	Flag	Description	Indication
1B8	1	Maritime distress alerting	A
	0	No Maritime distress alerting	blank
1B7	1	SafetyNET traffic	S
	0	No SafetyNET traffic	blank
1B6	1	Inmarsat-C traffic	C
	0	No Inmarsat-C traffic	blank
1B5	1	Store and Foward	T
	0	No Store and Foward	blank
1B4	1	Half duplex	H
	0	No Half duplex	blank
1B3	1	Full duplex	D
	0	No Full duplex	blank
1B2	1	Closed network	N
	0	No Closed network	blank
1B1	1	FleetNET traffic	F
	0	No FleetNET traffic	blank
2B8	1	Prefixed store and forward message supported	P
	0	Prefixed store and forward message not supported	blank
2B7	1	Land mobile alerting	Not used
	0	No Land mobile alerting	
2B6	1	Aero-C service supported	
	0	Aero-C not service supported	
2B5	1	ITA2 transmission supported	I
	0	ITA2 transmission not supported	blank
2B4	1	Data transmission supported	B
	0	Data transmission not supported	blank
2B3	1	Basic X.400 supported	X
	0	Basic X.400 not supported	blank
2B2	1	Enhanced X.400 supported	E
	0	Enhanced X.400 not supported	blank
2B1*	1	Low power C MES supported	L
	0	Low power C MES not supported	blank

*: Nera Mini-C, Inmarsat Mini-C system uses LES supporting “Low power C MES”.

Note: “The LES is out of service” message appears when LES which does not support MINI-C is selected in “transmitting” display ([F3]-1).

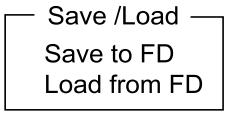
- TDM ch.: TDM channel being used by LES for transmission.

5.8 Saving and loading of system setting

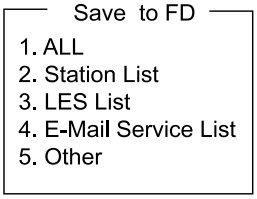
System settings and various lists on the system can be saved onto a floppy disk as a backup copy and it can be loaded to the system individually or at a time.

To save data onto floppy disk;

1. Press [F8][8]and [6] in order to show “Save/Load” display.



2. Select “Save to FD” and press [Enter].



3. Select the item to be saved.

4. Select [Yes] and press [Enter].

5. When “OK to Save ?” message appears, select “Yes” and then press [Enter].

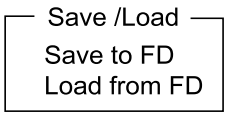
The data is saved in following file names.

Table 5.8.1 File name to be used

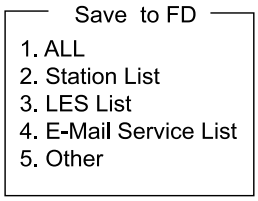
Item	File name	Description
1. ALL		All items are saved.
2. Station List	STATION.DAT	STATION list ([F8]-8-1)
3. LES List	LES.DAT	LES list ([F8]-8-2)
4. E-Mail Service List	EMAIL.DAT	E-MAIL service list ([F8]-8-5)
5. Other	DTE.DAT	Other terminal settings: Editor Setup ([F8]-2), Terminal Setup ([F8]-3) and E-Mail Setup ([F8]-6)
	SYSTEM.DAT	DCE settings: System Setup (Other than IMN ([F8]-1), EGC Setup ([F8]-4), EGC Channel list ([F8]-8-3) and NCS Channel list ([F8]-8-4)

To load data on floppy disk to system;

1. Press [F8][8] and [6] in order to show “Save/Load” display.



2. Select “Load from FD” and press [Enter].



3. Select the item to be loaded.

4. Select [Yes] and then press [Enter]. Selected items are loaded from the floppy disk to the terminal unit.

Nera Mini-C list data is compatible with Nera C PC version except for “5. Other”. The data is not compatible with Nera Mini-C non-PC version.

5.9 Compatibility with Nera C

5.9.1 Hardware

Most of PC boards used in Nera Mini-C are not compatible with Nera C.

Table 5.9.1 Board compatibility

Board	Nera C	Nera Mini-C	Remarks
RF CON/CPU	16P0208A	16P0208B	The circuit is the same, while RF CON/CPU program and mounting of the antenna connector are different.
TERM CPU	16P0209		Nera Mini-C uses PC as a terminal unit.
PWR	16P0211	16P0217	
PWR C	16P0214	16P0227	
SW	16P0212		
FDD	JU-226A032 FCK2149		
ANT RF	16P0207	16P0216	Do not use IC-115 for Nera Mini-C. PWR board is damaged because the power consumption of IC-115 is larger than IC-116. IC-116 may be used for Nera C for test. If so, the output power drops about 5 dB.
ANT B/element	16P0206		
GPS	GN-79		

5.9.2 Software

The table below compares Nera Mini-C program with Nera C program.

Table 5.9.2 Comparison between Nera C and Nera Mini-C

Program	Nera C	Nera Mini-C	Remarks
RF CON/CPU	1650159-01-xx	1650160-01-xx	Nera C provides distress alert function, but Nera Mini-C does not. Nera C does not scan automatically when the system unlocks, but Nera Mini-C does.
TERM CPU	1650162-01-xx		
Terminal	1650164-01-xx (PC version)	1650166-01-xx	Nera C PC version does not support following operations. 1) Distress setup (F8-1) 2) System setup (F8-2) except for IMN 3) EGC setup (F8-5) 4) EGC, NCS Channel List (F8-9-3, 4) 5) Log in/Log out (F7-1, 2) 6) Abort (F7-3) except for the message sent from PC 7) Select NCS, Ocean Region (F7-4, 5) 8) Distress Alert Button Test (F7-7-4) 9) Distress message of Transmit message (F3-1) 10) Format Disk (F1-8) Nera C terminal software bases on Nera Mini-C terminal software 1650162-01-xx. The difference: No distress alert function and no operation related to NAV port.

Chapter 6. Updating program

6.1 How to read program number

Table below lists Nera Mini-C software.

Table 6.1.1 Program number

Program name	Program number
Mini-C PC terminal	1650166-01.xx
RF CON/CPU board	1650160-01.xx

To read program number;

1. Press [F7/Option], [7/TEST] and [3/Self Test] in this order to carry out selftest. The test result includes program numbers as below.

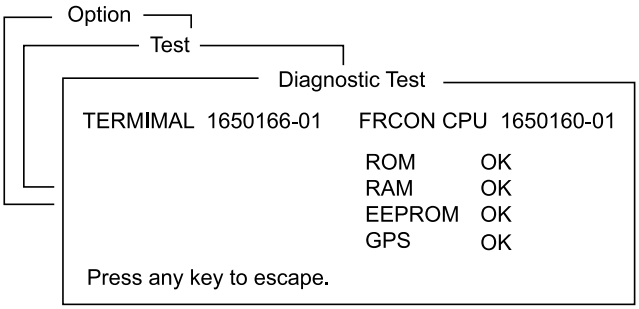


Fig. 6.1.1 Diagnostic Test display

2. Type Nera while holding [Ctrl] to show the program number in full digit.

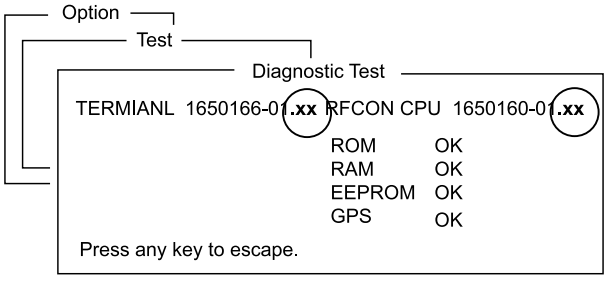


Fig. 6.1.2 Program number in full digit

6.2 Updating of RF CON/CPU Program

To update RF CON/CPU software;

1. Turn off the communication unit.

2. Connect a PC to DTE port on the communication unit (IC-216). When the PC is already connected, terminate Nera Mini-C PC terminal software by pressing [Alt] while holding down [F12].

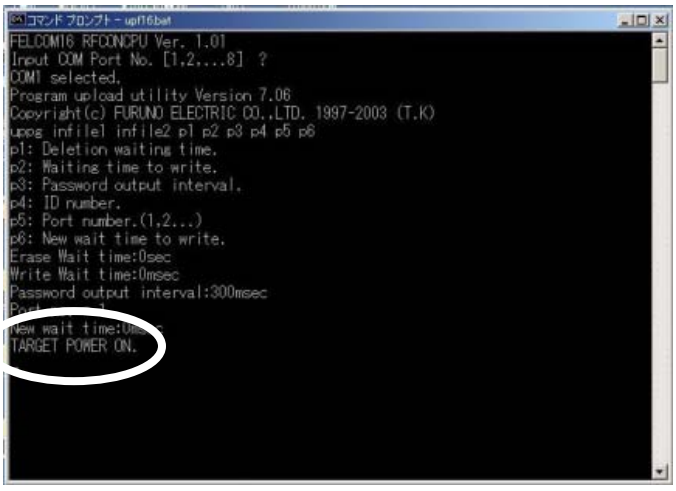
3. Open the command prompt window.

4. Insert the floppy disk which contains RF CON/CPU program into the floppy disk drive on the PC.

5. Type **A:** and press [Enter] to change active drive from C to A.

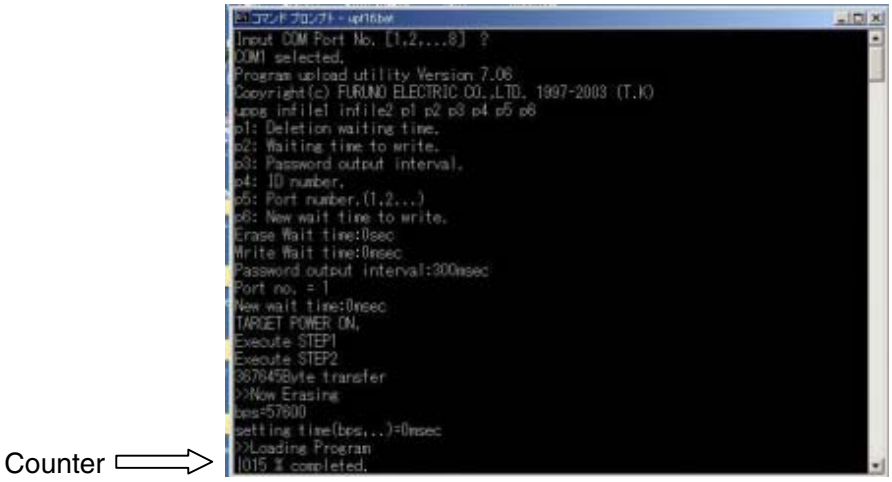
6. Type **UPF16.BAT**, followed by [Enter]. The PC screen should look like below.
   Nera Min-C RF CON/CPU Ver.1.xx
   Input Com Port No. [1, 2, …8]

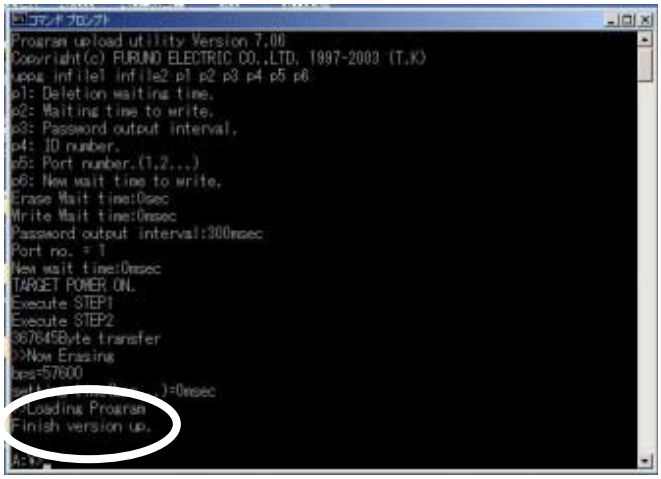
7. Enter the port number. For example, when Nera Mini-C is connected to COM-1 port on PC, enter **1**.


FELCOM16 RFCONCPU Ver. 1.01
Input COM Port No. [1,2,...8] ?
COM1 selected.
Program upload utility Version 7.06
Copyright(c) FURUNO ELECTRIC CO.,LTD. 1997-2003 (T.K)
uppg infile1 infile2 p1 p2 p3 p4 p5 p6
p1: Deletion waiting time.
p2: Waiting time to write.
p3: Password output interval.
p4: ID number.
p5: Port number.(1,2...)
p6: New wait time to write.
Erase Wait time:0sec
Write Wait time:0msec
Password output interval:300msec
TARGET POWER ON.

8. Wait until “TARGET POWER ON” message appears.

9. Turn on the communication unit. Updating is automatically performed. When the updating is completed, the message “Finish Version-up” appears.





10. Turn off the communication unit.

11. Verify program number referring to 6.1.

6.3 Updating of Terminal software

The procedure to update terminal software is the same as that of software installation. A PC of following specification can be used as Nera Mini-C terminal unit.

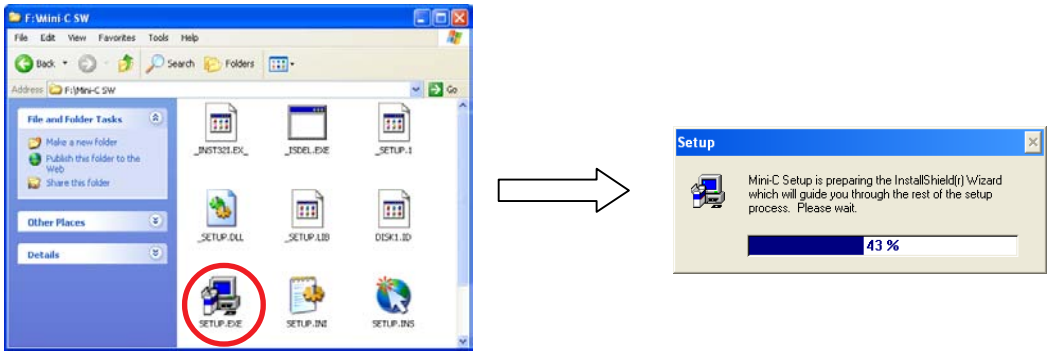
- OS : Windows 95/98/2000/NT/ME/XP
- Memory : 32 MB and more
- Free space on the hard disk: 20 MB and more
- CPU : Pentium 100 MHz and more
- Floppy disk drive : Available

To install/update terminal software;

1. Insert PC terminal program floppy disk into the floppy disk drive.

   PC Terminal program FD
   - Type: 16-5-0166
   - Code No.: 004-439-740

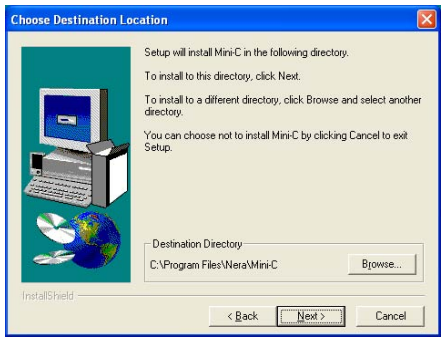
2. Double click “Setup.exe” file, and the installation starts automatically.


F:\Mini-C SW
File and Folder Tasks
Other Places
Details
SETUP.EXE
Setup
Mini-C Setup is preparing the InstallShield(r) Wizard which will guide you through the rest of the setup process. Please wait.
43 %

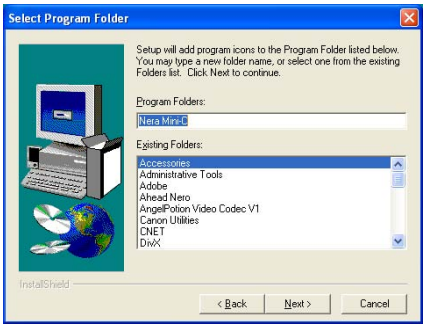
3. Follow instruction which appears on the screen. When updating Nera Mini-C terminal software, overwrite “Mini-C PC.EXE” file.

Welcome
Welcome to the Mini-C Setup program. This program will install Mini-C on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
InstallShield
< Back
Next >
Cancel

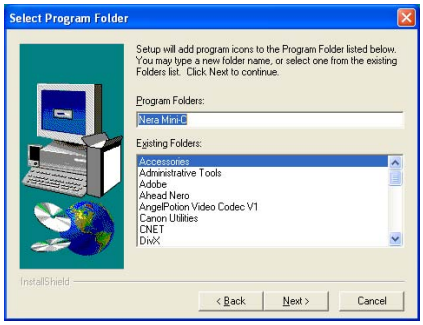
1. Click “NEXT”.


Choose Destination Location
Setup will install Mini-C in the following directory.
To install to this directory, click Next.
To install to a different directory, click Browse and select another directory.
You can choose not to install Mini-C by clicking Cancel to exit Setup.
Destination Directory
C:\Program Files\Nera\Mini-C
Browse...
InstallShield
< Back
Next >
Cancel

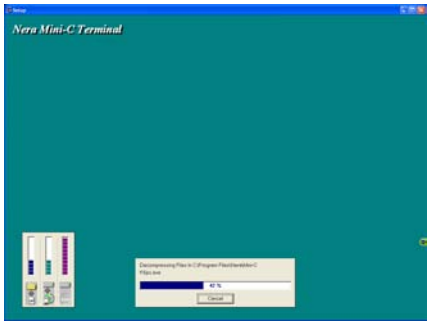
2. Check the folder to which the program is installed and then click “NEXT”.



3. Click “NEXT”.



4. Click “NEXT”.



5. Wait until the process is completed.

Setup Complete
Setup has finished copying files to your computer.
Setup will now launch the program. Select your option below.
Yes, Launch the program file
Click Finish to complete Setup.
InstallShield
< Back
Finish

6. Click “Finish”.

4. After installation, turn off the PC and on it again. To run Nera Mini-C terminal software, double click “F16PC.EXE” icon.

“Mini-C.EXE” icon

Nera Mini-C

6.4 Files in Program disk

Program disks contain following files. The file size is reference only.

Table 6.4.1 Program files

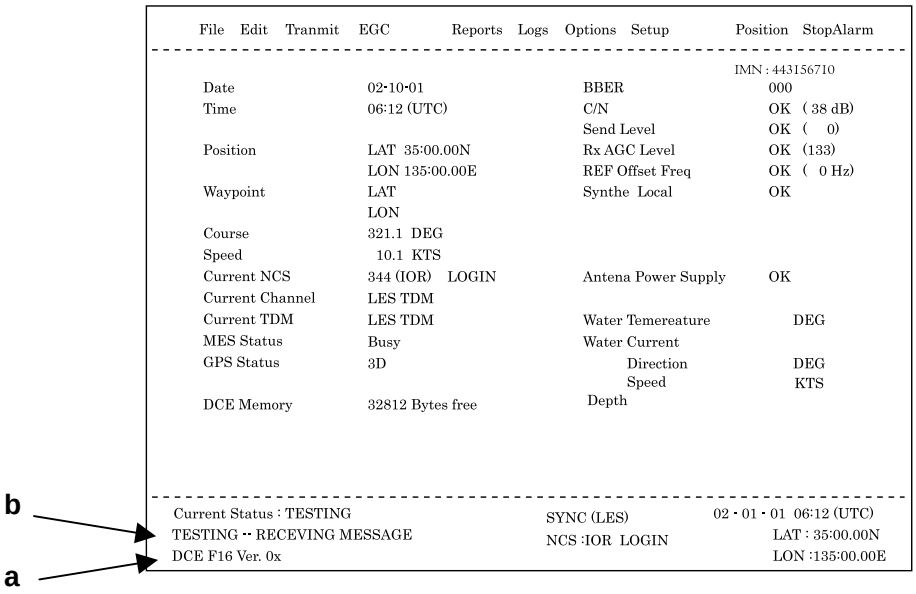
Terminal program for PC		Program for RF-CON CPU board	
File name	File size	File name	File size
inst32i.ex_	288 k	_UP.BAT	2 k
_isdel.exe	8 k	UPF16.BAT	1 k
_setup.1	406 k	KEY.EXE	29 k
_setup.dll		UPPG.EXE	189 k
_setup.lib	200 k	UPPGDOS.EXE	37 k
Disk1.id	1 k	LOADRFC.BIN	5 k
Setup.exe	45 k	RFCONCPU.BIN	360 k
Setup.ini	1 k	CHK-VER.EXE	32 k
Setup.ins	80 k		
Setup.iss	1 k		
Setup.pkg	1 k		

Following files are automatically created every time F16.EXE is executed.

- F15PC.LOG : Communication log file ([F6]-4), saving 32 logs.
- F15PC.REP : Settings in “Message, Data Report” ([F5]-1,2) menu from terminal unit.
- F15PC.RXM : Receiving message ([F6]-2 and –3) log files, saving 32 logs or 32 kB
- F15PC.TXM : Sending message ([F6]-1) log file, saving 5 logs.
- F16PC.DAT : Includes following settins;
  Editor Setup ([F8]-2), Terminal Setup ([F8]-3),
  Auto Mode Setup ([F8]-5), E-Mail Setup ([F8]-6),
  Directory ([F8]-7), Station List (F8-8-1), LES List ([F8]-8-2),
  E-Mail Service List ([F8]-8-5) and Printer Setting ([F1]-8)

7.1 Messages in Status display

This section describes the messages in the status display.



Message “a”

1) DCE Mini-C Ver.0x: Program version of CPU on RF CON/CPU board. “FFA” is added at FFA version.
2) Running Report Program (POLL): Appears during Program Report by Polling. This message is not displayed with FFA version.
3) When detecting the error, the following messages appear.
   - TROUBLE: ANT power voltage abnormality
   - TROUBLE: Synthesizer UNLOCK
   - TROUBLE: Carrier Power Level
   - TROUBLE: GPS module
   - Memory full for received msg.
4) TX ON: Appears during transmitting. This message is not displayed with FFA version.

Message “b”

1) CALLING: Appears during calling.
2) WAITING FOR ACKNOWLEDGEMENT: Appears when waiting acknowledgement from coast station.
3) RECEIVING EGC MESSAGE: Appears when receiving EGC message.
4) WAITING FOR BACKOFF: Appears when waiting transmission of data report.

Login/Logout ([F7]-1, 2)

5) Successful Login
6) Login failed
7) Successful Logout
8) Logout failed

Forced clearing ([F7]-3 (Abort))

9) Successful Forced Clearing
10) Forced Clearing failed

Communication from Ship to Shore

11) SENDING MESSAGE PACKET
12) WAITING FOR ACKNOWLEDGEMENT
13) Successful sending to LES
14) Sending message failed.
15) Call rejected
16) Call pending

Communication from Shore to Ship

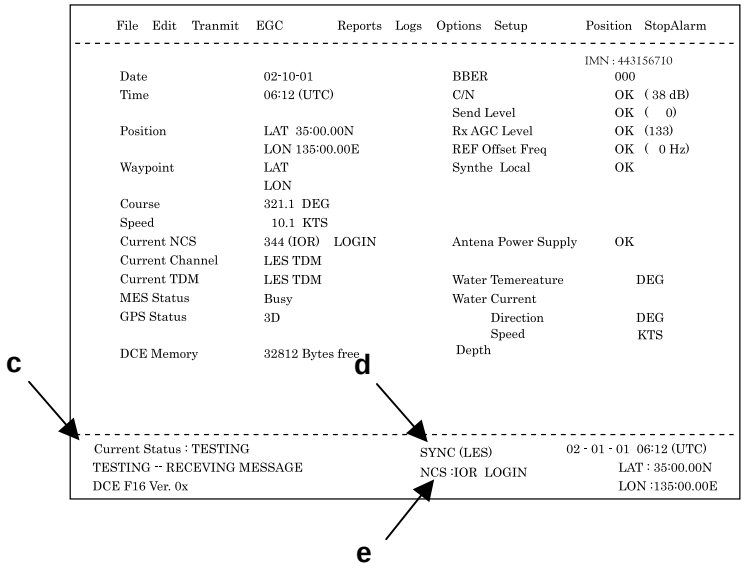
17) Received Call
18) Received Call (ITA2)
19) RECEIVING MESSAGE PACKETS
20) CLEARING
21) Successful receiving
22) Receiving failed

Data Report ([F5]-1)

23) Successful Data Report
24) Data Report failure

PV TEST ([F7]-7-1)

25) *PV TEST CALL is rejected. : Appears when PV test is rejected by LES.
26) *PV TEST CALL is pending. : Appears when PV test is pended.
27) *TEST--RECEIVING MESSAGE : Appears during reception of test message from LES.
28) *TEST--SENDING MESSAGE : Appears during transmission of test message to LES.
29) *TEST--DISTRESS ALERT : Appears during transmission of test distress message to LES.
30) *WAITING FOR ACTIVATION : Appears when waiting start of PV test.
31) *WAITING FOR TEST RESULT : Appears when waiting PV test result from LES.
32) *CLEARING : Appears when clearing PV test mode.
33) PV TEST is Completed. : Appears when PV test is completed.
34) PV TEST Failure : Appears when PV test is failed.



Message “c”

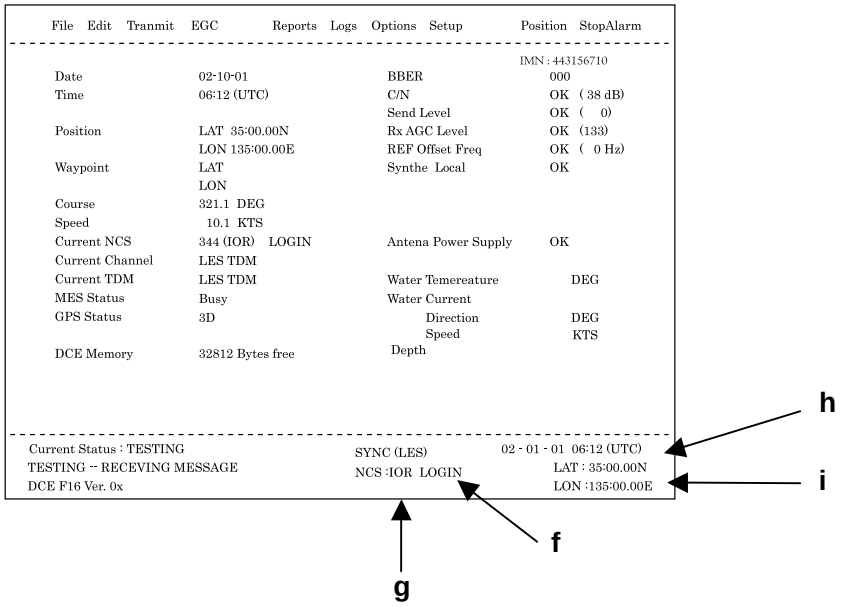
1) Idle: Appears when the system is in idle mode.
2) Idle (Pending): Appears when the system is in idle mode, waiting the response from LES.
3) Sending : Appears during transmission of message.
4) Receiving : Appears during reception of message.
5) Login : Appears during Login process.
6) Logout : Appears during Logout process.
7) Data Report : Appears during transmission of data report.
8) Testing : Appears during PV test.
9) Test Setup : Appears during request of PV test.
10) Scanning : Appears during scanning of NCS common channel.
11) EGC RECEIVER : Appears when the system is in EGC receiver mode.
12) Delivery Status Req. : Appears during transmission of delivery status request.
13) Forced Clearing : Appears during forced clearing of scan, transmission and reception.

Message “d”

1) Retuning : Appears during channel change or transmission.
2) SYNC (NCS) : Appears during synchronization to NCS common channel.
3) SYNC (LES) : Appears during synchronization to LES TDM channel.
4) MES Sig. Ch : Appears when changing to MES signaling channel.
5) MES Msg. Ch : Appears when changing to MES message channel.
6) UNSYNC : Appears when un-synchronizing.

Message “e”

1) NCS: AOR-W : Appears when using Atlantic Ocean Region West satellite.
2) NCS: AOR-E : Appears when using Atlantic Ocean Region East satellite.
3) NCS: IOR : Appears when using Indian Ocean Region satellite.
4) NCS: POR : Appears when using Pacific Ocean Region satellite.



Message “f”

1) LOGOUT : Appears after logout.
2) LOGIN : Appears after login.
3) LOGIN (Blinking) : Appears during login.

Message “g”

1) “ ” : Appears when full memory can be used for RX message or the printer is working.
2) REC.MESSAGE EXIST (Blinking): Appears when the printer does not work at message reception or a confidential message is received.
3) Data Report (Reversed video) : Appears when data report is set to ON.
4) Message Report (Reversed video) : Appears when message report is set to ON.

Message “h”

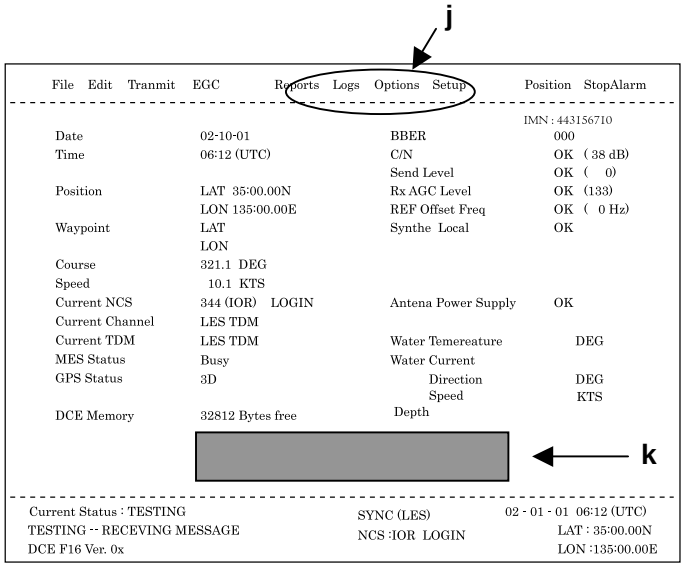
Date & Time (UTC):

Date in ZDA sentence from GPS is used. Time data is calculated from the TDM frame signal. If no ZDA, manually entered date data is used. Updated every minute.

Message “i”

Position (L/L):

Own ship’s position is displayed: either internal GPS or manually entered data. GPS data is updated every 30 seconds. When manually entered data is not updated for more than 4 hours, the blinking starts and the buzzer is released every 30 seconds.



Message “j”

1) “ ” : No message appears.
2) Stand alone Mode : Appears when in stand alone mode or LES is used as NCS.
3) Restoration Mode (Network Update Received) : Appears in restoration mode.
4) Restoration Mode (Blinking) : Appears in case of NCS failure.
5) Restoration Mode (Reversed video) : Appears when nominated LES transmits NCS common channel instead of NCS in failure.

Message “k”

1) Sending Distress Alert
2) Distress Acknowledgement Received
3) Distress Message Call Activated
4) Distress Message Call Acknowledged

Appears during PV TEST.

7.2 Messages which appear during menu operation

7.2.1 File menu operation ([F1])

1) Overwrite?
2) OK to save?
3) OK to delete file?
4) Can't delete.
5) Enter new filename
6) Can't rename.
7) Insert new disk for drive
8) And select media type
9) Format start.
10) xx % Completed.
11) Format completed.
12) Format failed.
13) Press any key to escape.
14) Abort process.
15) Drive not ready.
16) Write protected.
17) Drive error.
18) Checking
19) Decode?
20) Now decoding...
21) Complete.
22) Decode failed.
23) This terminal not support this code.
24) Decoded %d file(s).
25) This file is not encoding.
26) File is already exist. Overwrite?
27) Directory not found.

7.2.2 Transmit menu operation ([F3])

1) Input Error: Message File.
2) Input Error: Country/Ocean Code.
3) Input Error: Station ID.
4) Input Error: Modem Type.
5) Input Error: E-Mail Address.
6) Input Error: LES ID.
7) Input Error : Send Delay.
8) Input Error : Prefix Code.
9) Invalid character detected in message.
10) Don't support E-Mail service in this NCS.
11) Input Error: Too many stations.
12) Message file is too large (but enable to send).

13) Attach file is too large.
14) Attach file '%s' is not found.
15) Message is entered in sending Queue. Press any key.
16) Can't enter this message to sending Queue. Press any key.
17) The LES is out of service.

7.2.3 Data Report menu operation ([F5]-1)

1) Input Error: Country/Ocean Code.
2) Input Error: Station ID.
3) Input Error: LES ID.
4) Input Error: Interval Time
5) Input Error: Start Time
6) Input Error: Modem Type
7) Input Error: Report Contents
8) Input Error: Report Times
9) Input Error: Destination
10) Input Error: E-Mail Address
11) Don't support E-Mail service in this NCS.
12) Input Error: Prefix Code

7.2.4 PV test operation ([F7]-6-1)

Starting PV Test Process.

Automatic test mode: Normal communication disabled.
Do not press any distress button unless you are in distress.

7.2.5 Message for Printer ([F1]-8)

1) "Can't print. PRINTER NOT READY."

: When the message cannot be printed with selecting “PP-510” through “Print setting” ([F1]-8).

Note) When the message cannot be printed with selecting “Windows printer” through “Print setting” ([F1]-8), the error message is output from the “Windows”.

2) There is no printer installed.

: When “Windows printer” is selected through “Print setting” ([F1]-8) without installing the printer driver to the PC.

7.3 Messages related to Inmarsat system

INF: Logout request accepted. Please wait.
INF: Frequency Offset NG.
Signaling Channel congestion.
Lost TDM.
Reservation Lost.
The LES is out of service.
Too many retries.

Self test error messages

TROUBLE: RFCON CPU ROM NG.
TROUBLE: RFCON CPU RAM NG.
TROUBLE: RFCON CPU EEPROM NG.

System error messages

TROUBLE: Synthesizer UNLOCK.
TROUBLE: ANT power voltage anomaly.
TROUBLE: Carrier power level.
TROUBLE: EEPROM ERROR.
TROUBLE: Invalid MES ID, This equipment is defected. Please contact Nera SatCom.

Warning messages

WARNING: Memory Full for receive message.
WARNING: Message received for DTE PORT. Please turn on DTE port equipment.
WARNING: Internal GPS UNIT failure.
WARNING: Can not enter new ENID. Memory Full for ENIDs.
WARNING: Can not enter new DNID. Memory Full for DNIDs.
WARNING: Synchronization loss. Please change EGC Channel.
WARNING: Synchronization loss. Please check the current NCS.
WARNING: Synchronization loss. Scanning NCS started automatically.
WARNING: BBER over 80%. Scanning NCS start manually.
WARNING: Can not find NCS CC in preferred region. Scanning all region is started.
WARNING: Can not find NCS CC in all region. Scanning is continued.

Information

INF: Please update current ship position.
INF: NCS has gone outage. (RESTORATION Mode)
INF: You can select preferred LES by Network Information Window.
INF: Distress Priority Message received.
INF: Urgent Priority EGC Message received.
INF: Distress Priority EGC Message received.
INF: ENID ***** was entered by EGC message.
INF: ENID ***** was deleted by EGC message.
INF: DNID ***** was entered by Polling.

INF: DNID ***** was removed by Polling.
INF: Pre-set LES ID for DISTRESS ALERT is overwritten by LES ***.

***** Login *****
Successful Login.
Login failed.
Login aborted.
MES Signaling Failure, Login Request not sent to NCS.
Timeout! Login Acknowledgement not received.
Login failed because of RESTORATION mode Network.

***** Logout *****
Successful Logout.
Logout failed.
Logout aborted.
MES Signaling Failure, Logout Request not sent to NCS.
Timeout! Logout Acknowledgement not received.
Logout failed because of RESTORATION mode Network.

***** Transmit *****
Successful Sending message to LES.
Sending message failed.
Sending message aborted.
MES Signaling Failure, during sending message.
(*) Sending message aborted by LES because of ---
LES protocol error detected, Invalid Assignment.
(**) Call rejected by LES because of ---
(*) Call pending by LES because of ---
Selected LES not exist in current region.
Awaiting message transfer.
Message sending failure, unauthorized DNID LES_ID pare.
Successful Delivery Status Request.
Delivery Status Request is failed.
Delivery Status Request is aborted.
MES Signaling Failure, Delivery Status Request not sent.
Timeout! LES response not received.

***** Receive *****
Successful Receiving message.
Receiving message failed.
Receiving message aborted.
MES Signaling Failure, during receiving message.
(*) Receiving message aborted by LES because of ---

***** Data Report *****
Successful Poll Acknowledgement Sending.
Poll Acknowledgement Sending failed.
Successful Data Report Sending.
Data Report aborted.
Reserved access failure, trying unreserved access.
Data Report failed, too long report.
Data Report failed, unauthorized DNID.
Data Report failed, MES is not login.
MES Signaling Failure, Data Report failed.
Data Report failed, selected LES not exist in current region.
Data Report failed, TDM LOST.
Successful Data Report Programming by Polling.
Data Report Programming failure by Polling, invalid parameters.
Data Report Program has been initiated by Polling.
Data Report Program has been stopped by Polling.

***** PV TEST *****
PV TEST is completed.
PV TEST is failed.
PV TEST is aborted.
MES Signaling Failure, during PV TEST.
Receiving Test Failure, Timeout while waiting on NCS CC.
Sending Test Failure, Too many retries.
(*) PV TEST is aborted by LES because of ---
(*) PV TEST is pending by LES because of ---
(**) PV TEST is rejected by LES because of ---
PV TEST aborted because of RESTORATION mode.
Please activate Distress Alert TEST within 2 min.
TIMEOUT !! Distress Alert Test is automatically activated.

***** Forced Clear *****
Successful Forced Clearing.
Forced Clearing failed.
Forced Clearing aborted.
MES Signaling Failure, Forced Clear not sent.
Timeout! Clear not received.

The (*) mark messages are "aborted" and "pending" by following reasons. LES sends these messages.

-- *LES timeout.*
-- *MES protocol error detected.*
-- *LES hardware error detected.*
-- *operator forced clear.*

-- MES forced clear.
-- LES protocol error detected.
-- MES fatal hardware error detected.
-- MES timeout.
-- unrecognized presentation code.
-- unable to decode.
-- IWU number is invalid.
-- MES has not subscribed.
-- requested service unavailable.
-- access to requested service denied.
-- invalid service.
-- invalid address.
-- destination MES not commissioned.
-- destination MES not logged in.
-- destination MES barred.
-- requested service not provided.
-- protocol version not supported.
-- Unrecognized PDU type.

The (**) mark messages are "rejected" by following reasons. LES sends these messages.

-- signalling failure.
-- LES message store full.
-- requested destination not service.
-- satellite congestion.
-- terrestrial congestion.
-- requested service not provided.
-- request in queue.
-- request barred.
-- MES not logged in.
-- MES not commissioned.
-- waiting TDM assignment.
-- illegal request
-- LES not in service.
-- requested service unavailable.
-- access to requested service denied.
-- invalid service.
-- invalid address.
-- unable to decode.
-- IWU number is invalid.
-- MES has not subscribed.
-- protocol version not supported.
-- PSTN modem type not supported.
-- Unrecognized PDU type.

Response messages

Ignored: You are connected with DTE 2 port.
Ignored: Format Error.
Ignored: Undefined Command.
Ignored: Can not abort current process.
Ignored: Can not Forced Clear current process.
Ignored: Awaiting message transfer, Can not start PV TEST.
Ignored: PV TEST has been already started, and now pending.
Ignored: Sending Message not exist.
Ignored: Distress Request command not received.
Ignored: Can not start Distress Alert Test now.
Ignored: MES is not idle.
Ignored: Now receiving EGC message.
Ignored: MES is not Login. Please operate Login.
Ignored: Current Network is restoration mode.
Ignored: NCS Common Channel Failure.
Send message already exist in DCE.
Message not exist.
Service request not received.
Input Error: Service Code
Input Error: Message Reference No.
Input Error: Destination Type
Input Error: LES ID
Input Error: NCS ID
Input Error: Channel No.
Input Error: Date or Time
Input Error: MES Mode
Input Error: Navigation Select
Input Error: Sub_address
Input Error: Port Select
Input Error: Geographical Coordinate
Input Error: Navarea Code
Input Error: Fixed Area Code
Input Error: WMO Area Code
Input Error: NAVTEX Code
Input Error: EGC Auto Selection
Input Error: Protocol Code
Input Error: Nature Code
Input Error: Course Data
Input Error: Speed Data

No response from communication unit.:

Message output from PC(Terminal) when no response is sent from RF CON/CPU after sending the command from PC(Terminal).

Appendix 1) Data reporting and Polling

Nera C functions the same Data reporting and Polling as Nera Mini-C. This chapter is also applied to Nera C.

AP1.1 Introduction

The Data Reporting service allows the MES to send data reports (position data, for example) and short messages (max 32 bytes). To obtain position data the MES must be connected to a navigation system or coordinates must be entered manually.
Polling is used by the base station to initiate transmission of a data report or message. The poll command tells the MES how and when to respond. Polling is either individually directed, group directed or area directed.
Data reporting and polling are available for any registered user which is provided with a Data Network ID (DNID), which is downloaded to all MESs. Data reporting is often used in combination with polling.

Fig.1.1.1 shows the outline of data reporting and polling, and Fig.1.1.2 the operational flow chart.

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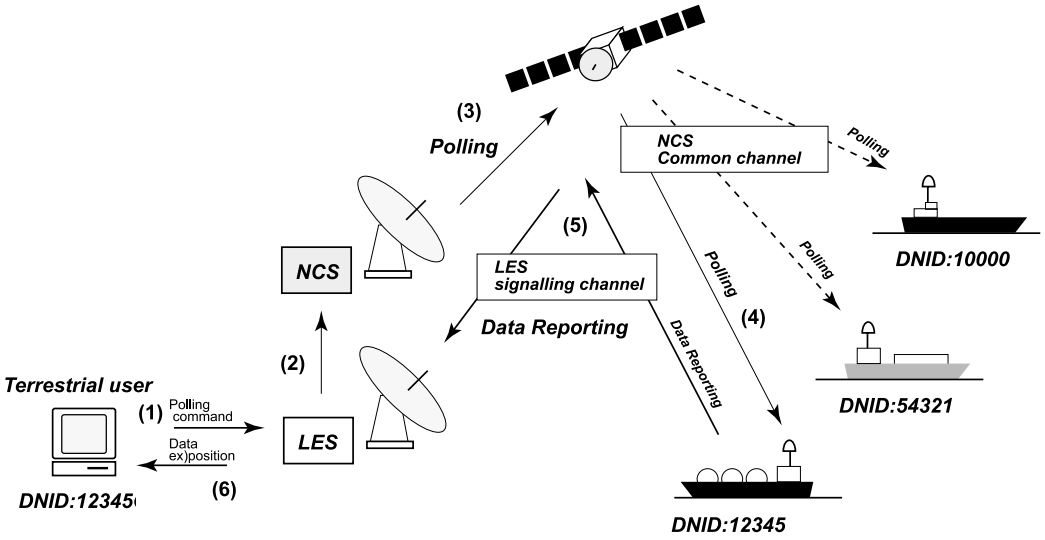


Fig.1.1.1 Data reporting and Polling

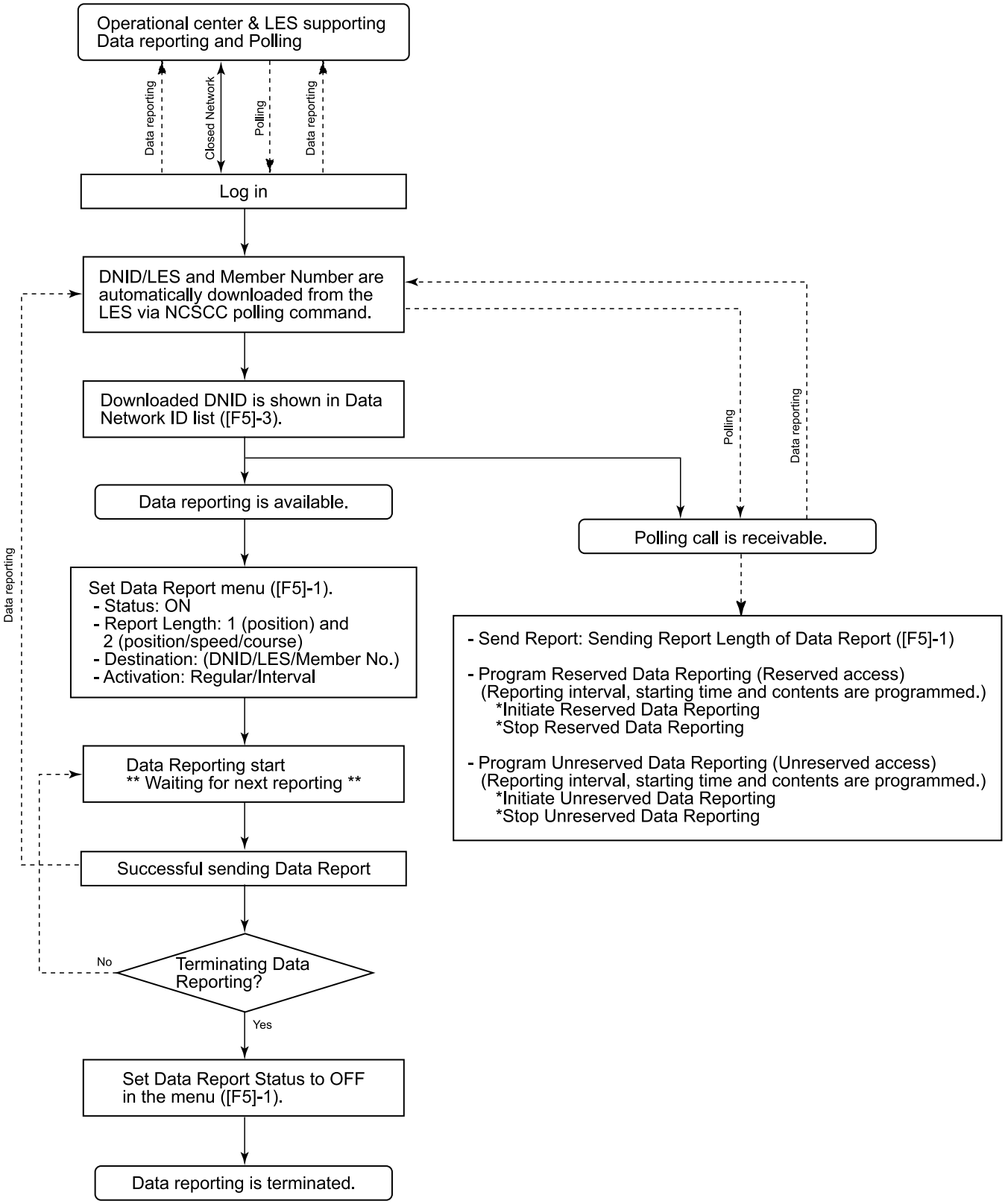

Operational center & LES supporting Data reporting and Polling
Data reporting
Closed Network
Polling
Data reporting
Log in
DNID/LES and Member Number are automatically downloaded from the LES via NCSCC polling command.
Downloaded DNID is shown in Data Network ID list ([F5]-3).
Polling
Data reporting
Data reporting is available.
Polling call is receivable.
Data reporting
Set Data Report menu ([F5]-1).
- Status: ON
- Report Length: 1 (position) and 2 (position/speed/course)
- Destination: (DNID/LES/Member No.)
- Activation: Regular/Interval
- Send Report: Sending Report Length of Data Report ([F5]-1)
- Program Reserved Data Reporting (Reserved access)
(Reporting interval, starting time and contents are programmed.)
*Initiate Reserved Data Reporting
*Stop Reserved Data Reporting
- Program Unreserved Data Reporting (Unreserved access)
(Reporting interval, starting time and contents are programmed.)
*Initiate Unreserved Data Reporting
*Stop Unreserved Data Reporting
Data Reporting start
** Waiting for next reporting **
Successful sending Data Report
No
Terminating Data Reporting?
Yes
Set Data Report Status to OFF in the menu ([F5]-1).
Data reporting is terminated.

Fig.1.1.2 Data report/Polling operational flowchart

AP1.1.1 Sending Data report

At any time, MES can send a data report through Data Report menu. Data reporting uses Signalling Channel while Message reporting ([F5][2]) uses Message channel. By transmitting through the Signalling Channel, it is unnecessary to return to a message channel meaning that the data reports can be exchanged much faster than normal messages.

Up to 4 data reports can be programmed as shown in Table 1.1.1. The polling command does not affect the data report menu. To show the menu, press [5] then [1].

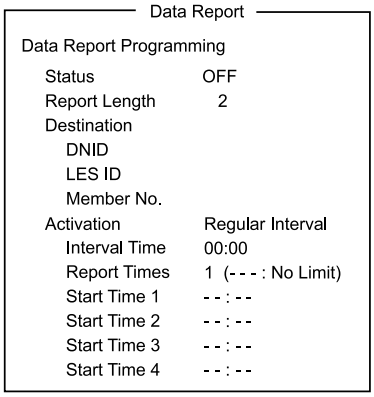

Data Report
Data Report Programming
Status OFF
Report Length 2
Destination
DNID
LES ID
Member No.
Activation Regular Interval
Interval Time 00:00
Report Times 1 (- - - : No Limit)
Start Time 1 - - : - -
Start Time 2 - - : - -
Start Time 3 - - : - -
Start Time 4 - - : - -

Fig.1.1.3 Data Report menu ([F5]-1)

Table 1.1.1 Description of Data Report setting

Item	Description
Status	ON: Initiates Data Reporting according to the parameter set in “Report Length”. OFF: Stops Data Reporting
Report Length	1: 1 packet report, including only position data 2: 2 packet report, including Position, course, speed and 10-byte user defined data* 3: 3 packets report, including Position, course, speed and 10 and 12 byte user defined data*. As the third packet has no data, do not use report length “3”.
Destination	DNID: Destination DNID is entered. LES ID: Automatic setting when DNID is entered. Member No.: Automatic setting when DNID is entered.
Activation	Reporting interval is selected; Regular interval and Daily.
Interval Time	Interval time 10 minutes or more is entered.
Report Times	The number of data report to be made is entered.
Start Time (UTC)	Start time is entered for daily data report.

*: Application software is required for editing user-defined data.

AP1.1.2 Messages

"Running Report Program (POLL)" and "DCEF15(16) Ver-xx" messages appear alternately at the lower left-hand corner of the screen when the task defined by the polling command starts excuting.

Messages related to Polling and Polling Data Reporting are;

"INF: DNID ***** was entered by Polling."

"INF: DNID ***** was removed by Polling."

"Message sending failure, unauthorized DNID LES_ID pare."

"WARNING: Can not enter new DNID. Memory Full for DNIDs."

"Successful Poll Acknowledgement Sending."

"Poll Acknowledgement Sending failed."

"Successful Data Report Sending."

"Data Report aborted."

"Reserved access failure, trying unreserved access."

"Data Report failed, too long report."

"Data Report failed, unauthorized DNID."

"Data Report failed, MES is not login."

"MES Signaling Failure, Data Report failed."

"Data Report failed, selected LES not exist in current region."

"Data Report failed, TDM LOST."

"Successful Data Report Programming by Polling."

"Data Report Programming failure by Polling, invalid parameters."

"Data Report Program has been initiated by Polling."

"Data Report Program has been stopped by Polling."

AP1.1.3 Operation

Data report transmitting in Inmarsat C (MES)

Data reports are sent from the MES to the LES on the signaling channel. If more than one MES transmits in the same slot, it results in a “Collision” at the receiving LES or MES. To minimize the time elapsed before an MES becomes aware that its transmission was not successful, the signaling channel descriptor packet transmitted in each frame on the TDM indicates the status of all slots associated with that signaling channel (that is, reserved, unreserved, received, not received). The burst packets used by the MESs to access the signaling channel do not have dedicated acquisition preambles, thus, maximizing the channel capacity. The MES monitors the signaling channel descriptor packets and will be informed of any errors.

De-activation of DNIDs

DNID can be de-activated and re-activated by the operator in the keystroke of [F5] and [3]. De-activation of a DNID causes all activity associated with that DNID to be stopped.

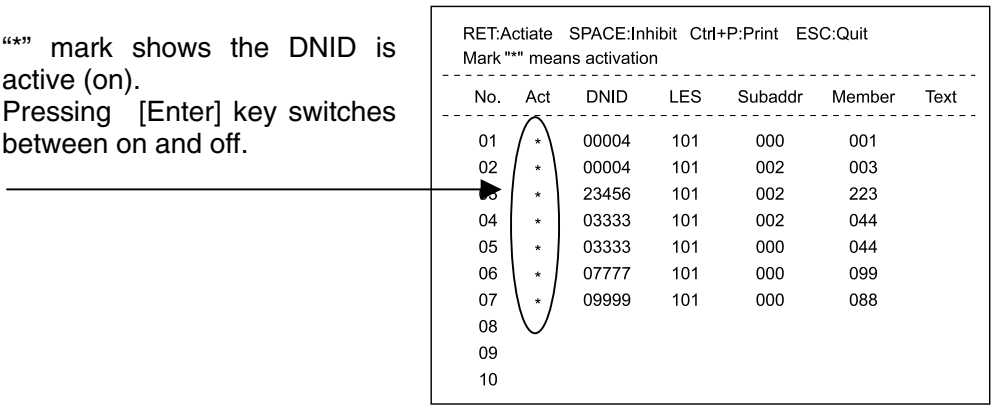

“*” mark shows the DNID is active (on).
Pressing [Enter] key switches between on and off.
RET:Actiate SPACE:Inhibit Ctrl+P:Print ESC:Quit
Mark "*" means activation
No. Act DNID LES Subaddr Member Text
01 * 00004 101 000 001
02 * 00004 101 002 003
* 23456 101 002 223
04 * 03333 101 002 044
05 * 03333 101 000 044
06 * 07777 101 000 099
07 * 09999 101 000 088
08
09
10

Fig.1.1.4 Data network ID list ([F5][3])

Overwriting polling command

When a program poll has been received and a second program poll is then received, the MES will overwrite (update) the information stored already.

Power interruption or loss of TDM synchronization

Loss of power and TDM synchronization when performing programmed data reporting, and in the event of a power interruption or loss of TDM synchronization, the MES stops sending the report. When normal condition is resumed, the next scheduled transmission occurs.

Inputting position data

Nera Mini-C determines the position with a built-in GPS which outputs GGA, RMC, GLL, VTG, GSV and ZDA sentences. The priority of the position data to be used is GGA>RMC>GLL>RMA. With Nera C, internal (optional) or external GPS is selected.

GGA (Global positioning system fix data)

$--GGA, hhmmss.ss, llll.ll, a, yyyyy.yy, a, , x, xx, x.x, x.x, M, x.x, M, x.x, xxxx *hh<CR><LF>
a b c d e f g h i j k l

a: UTC of position b: Latitude, N/S c: Longitude, E/W d: GPS quality indicator
e: Number of satellites in use f: Horizontal dilution of precision
g: Antenna altitude above/below mean sea level (geoid) h: Units of antenna altitude, m
i: Geoidal separation (difference between the WGC-84)
j: Units of geoidal separation, m k: Age of differential GPS data
l: Differential reference station ID

RMC (Recommended minimum specific GNSS data)

$--RMC, hhmmss.ss, A, llll.ll, a, yyyyy.yy, a, x.x, x.x, xxxxxx, x.x, a, a *hh<CR><LF>
a b c d e f g h i

a: UTC of position fix b: Status c: Latitude, N/S
d: Longitude, E/W e: Speed over ground, knots
f: Course over ground, degrees true g: Date: dd/mm/yy
h: Magnetic variation, degrees, E/W i: Mode indicator

GLL (Geographic position, latitude/longitude)

$--GLL, llll.ll, a, yyyyy.yy, a, hhmmss.ss, A, a *hh<CR><LF>
a b c d e

a: Latitude, N/S b: Longitude, E/W c: UTC of position
d: Status e: Mode indicator

VTG (Course over ground and ground speed)

$--VTG, x.x, T, x.x, M, x.x, N, x.x, K, a *hh<CR><LF>
a b c d e

a: Curse over ground, degrees true b: Curse over ground, degrees magnetic
c: Speed over ground, knot d: Speed over ground, km/m e: Mode indicator

ZDA (Time and Date)

$--ZDA, hhmmss.ss, xx, xx, xxxx, xx, xx*hh<CR><LF>
a b c d e f

a: UTC b: day c: month d: year e: Local zone hours f: Local zone minutes

GSV (GNSS satellites in view)

AP1.2 Polling command and packet

AP1.2.1 Polling type and packet

Polling is used by the base station to initiate transmission of a data report or message. The Poll command tells the MES how and when to respond and can also include a coded text message or IA5 text of up to 256 characters (maximum packet length is 300 bytes). All polling packets can include instructions for all the addressed MESs to respond with data reports that acknowledge the poll. There are three types of polling:

1) Individual Polling

Individual polling means that an explicit poll command is sent to MESs on an individual basis. The poll is originated by a terrestrial subscriber, usually a base station associated with the MESs that are being polled. An individual poll command is sent to each MES on the list; if the MES is busy, the poll is queued until the MES is idle. On receipt of a polling command, the MES responds in accordance with the instructions it has been given.

2) Group Polling

With group polling, a single poll command is broadcast on the NCS common channel. MESs respond only if they are idle and they receive the poll. The transmission of the poll command may be repeated in order to obtain responses from MESs that did not respond the first time.

3) Area Polling

Area polling is similar to group polling except that only MESs located in a specified geographical area are addressed. This geographical area is defined by coordinates in the poll message.

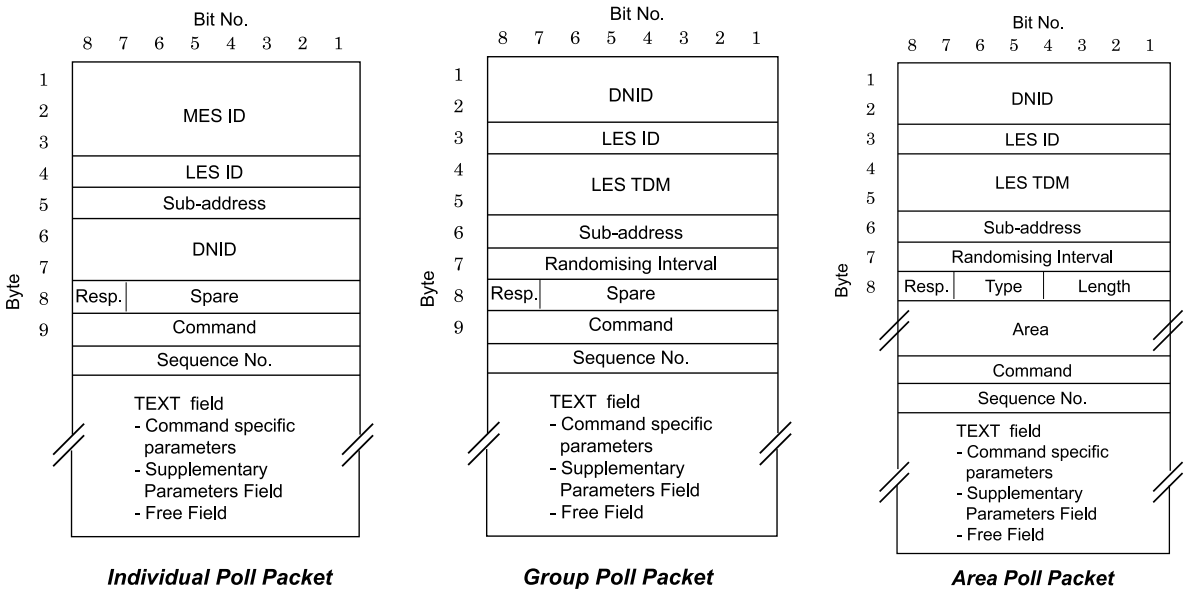


Fig.1.2.1 Polling packet format

Table 1.2.1 Polling packet format (a)

Polling	Bits	Signal name	Description
Individual	24	MES ID	The forward 24 bit Identifier for the addressed MES.
	8	LES ID	The network identifier for the particular LES.
	8	Sub-address	This field is used by the poll originator to route polls at the destination MES(s). Depending on the configuration of the MES DCE, it corresponds to a physical port on the DCE or a logical sub-address at the DCE or DTE.
	16	DNID	The DNID to which the MES belongs.
	2	Response	The anticipated response expected from the MES following the poll.
	6	Spare	
	8	Command	The command has the following format: Ack: This is a 1 bit flag which indicates if the MES should acknowledge receipt of the poll (by sending an acknowledgement data report to the LES originating the poll). Command Type: This indicates the type of command, specifically if this is for the MES DCE (i.e., a download/delete or programming command) or is for the DTE or application. Command codes 40H – 7FH are user definable and are not intercepted by the MES DCE. See Table 1.2.4 for polling commands.
	8	Sequence Number	The sequence number of the poll. It is used to ensure that duplicate polls are not passed to the application. It is not necessary for the sequence number to be passed to the DTE/application, but it is not precluded.
	-	TEXT	A free field which may contain further parameters depending on the command type. In the case of a download command this will just contain the member number (of that MES in the DNID). A presentation code is not defined for this field (it is application specific), except for download and delete commands which are to be processed by the MES DCE in which case the presentation is IA5 with odd parity. MES DCE programming information is also conveyed in this field in which case the formatting of the program parameters is pre-defined.

Table 1.2.2 Polling packet format (b)

Polling	Bits	Signal name	Description
Group (Cont'd)	16	DNID	The DNID to which the MES belongs, or the DNID to be downloaded or deleted if the command field specifies one of these commands. DNIDs are not unique within the network but are unique to each LES.
	8	LES ID	The network identifier for the particular LES. Note that the Group address consists of both the DNID and the LES ID.
	16	LES TDM	The satellite frequency code for the TDM channel, if the LES is using a permanent TDM, or FFFFH to indicate Demand Assigned operation. Note that this may be different from the satellite frequency code provided for that LES in the network configuration information (obtained from a login acknowledgement or network update). The MES shall use the LES TDM satellite frequency code supplied in the poll for the response and/or acknowledgement (if either were requested).
	8	Sub-address	This field may be used by the poll originator to route polls at the destination MES(s). Depending on the configuration of the MES DCE, it may correspond to a physical port on the DCE or a logical sub-address at the DCE or DTE.
	8	Randomizing Interval	In the event that a data report or acknowledgement data report are to be transmitted in response to the poll, then the randomizing interval defines the number of frames over which the MES is to randomize its response (i.e. if the randomizing interval is X, the MES randomly selects a number between 1 and X and sends its response after waiting this number of frames). The randomization interval shall also be used if the response to the poll is a message transfer. In this case the randomization applies to the assignment request only. Note that his randomization interval should not be confused with the randomization interval of the bulletin board. MESs should remain tuned to the NCS TDM until the randomization backoff has occurred.
	2	Response	The anticipated response expected from the MES following the poll. Note that this facility may or may not be used by the application. Therefore the actual response sent by the MES may differ from that expected.
	16	Spare	
	8	Command	The command has the following format: Ack: This is a 1 bit flag which indicates if the MES should acknowledge receipt of the poll (by sending an acknowledgement data report to the LES originating the poll). Command Type: This indicates the type of command, specifically if this is for the MES DCE (i.e., a download/delete or programming command) or is for the DTE or application. Command codes 40H – 7FH are user definable and are not intercepted by the MES DCE.

	8	Sequence No.	The sequence number of the poll. It is used to ensure that duplicate polls are not passed to the application. It is not necessary for the sequence number to be passed to the DTE/application, but it is not precluded.
	-	TEXT	A free field which may contain further parameters depending on the command type. In the case of a download command this will just contain the member number (of that MES in the DNID). A presentation code is not defined for this field (it is application specific), except for download and delete commands which are to be processed by the MES DCE in which case the presentation is IA5 with odd parity. MES DCE programming information is also conveyed in this field in which case the formatting of the program parameters is pre-defined.

Table 1.2.3 Polling packet format (c)

Polling	Bits	Signal name	Description
Area (Cont'd)	16	DNID	The DNID to which the MES belongs, or the DNID to be downloaded or deleted if the command field specifies one of these commands. DNIDs are not unique within the network but are unique to each LES.
	8	LES ID	The network identifier for the particular LES. Note that the Group address consists of both the DNID and the LES ID.
	16	LES TDM	The satellite frequency code for the TDM channel, if the LES is using a permanent TDM, or FFFFH to indicate Demand Assigned operation. Note that this may be different from the satellite frequency code provided for that LES in the network configuration information (obtained from a login acknowledgement or network update). The MES shall use the LES TDM satellite frequency code supplied in the poll for the response and/or acknowledgement (if either were requested).
	8	Sub-address	This field may be used by the poll originator to route polls at the destination MES(s). Depending on the configuration of the MES DCE, it may correspond to a physical port on the DCE or a logical sub-address at the DCE or DTE.
	8	Randomizing Interval	In the event that a data report or acknowledgement data report are to be transmitted in response to the poll, then the randomizing interval defines the number of frames over which the MES is to randomize its response (i.e. if the randomizing interval is X, the MES randomly selects a number between 1 and X and sends its response after waiting this number of frames). The randomization interval shall also be used if the response to the poll is a message transfer. In this case the randomization applies to the assignment request only. Note that his randomization interval should not be confused with the randomization interval of the bulletin board. MESs should remain tuned to the NCS TDM until the randomization backoff has occurred.

	2	Response	The anticipated response expected from the MES following the poll. Note that this facility may or may not be used by the application. Therefore the actual response sent by the MES may differ from that expected.
	3	Type (Area)	This is a 3 bit field and defines the area type; Navarea, circular are etc.
	3	Length (Area)	This is a 3 bit field and defines the area address length in bytes.
	-	Area	The formatting of the area address is identical to the formatting currently used to define EGC area addresses.
	8	Command	The command has the following format: Ack: This is a 1 bit flag which indicates if the MES should acknowledge receipt of the poll (by sending an acknowledgement data report to the LES originating the poll). Command Type: This indicates the type of command, specifically if this is for the MES DCE (i.e., a download/delete or programming command) or is for the DTE or application. Command codes 40H – 7FH are user definable and are not intercepted by the MES DCE.
	8	Sequence No.	The sequence number of the poll. It is used to ensure that duplicate polls are not passed to the application. It is not necessary for the sequence number to be passed to the DTE/application, but it is not precluded.
	-	TEXT	A free field which may contain further parameters depending on the command type. In the case of a download command this will just contain the member number (of that MES in the DNID). A presentation code is not defined for this field (it is application specific), except for download and delete commands which are to be processed by the MES DCE in which case the presentation is IA5 with odd parity. MES DCE programming information is also conveyed in this field in which case the formatting of the program parameters is pre-defined.

AP1.2.2 Polling command

Polling commands are used for the following purposes in the Position Reporting Service:

1) To initiate Data Reports
2) To download and delete the DNID.
3) To program MESs with the parameters used for the Received Data Reporting Protocol.
4) To send a text or data messages to MESs.

Unreserved Data Reporting

Unreserved data reporting allows an MES to transmit small quantities of user data to a DNID file, associated with a previously downloaded DNID and LES ID. The data

reports use unreserved access on the LES signaling channels (hence the name). Unreserved data reporting can be initiated at any time by using the keystroke of [F5][1]. A maximum of 3 packets is sent.

Reserved Data Reporting

Reserved access is only available by programming the MES using suitable poll command types. It allows an MES to be programmed to transmit regular data reports at precisely known times. The advantage of this method over unreserved access data reporting is that the times of transmission are precisely controlled, the transmissions are less susceptible to collision or corruption from competing MES transmissions, and more efficient use is made of the available signaling channel resources. A maximum of 4 packets is sent.

Table 1.2.4 lists the polling commands. The minimum subset of commands that an LES and an MES should support for a polling service consists of commands 0AH to 0BH. Nera Mini-C/Nera C supports all commands.

Table 1.2.4 Polling command

Command type	Meaning	Poll type
00H	Send Unreserved Report as required in Response	Any
01H	Program Reserved Data Reporting	Individual
02H	Initiate Reserved Data Reporting	Any
03H	Stop Reserved Data Reporting	Any
04H	Program Unreserved Data Reporting	Any
05H	Initiate Unreserved Data Reporting	Any
06H	Stop Unreserved Data Reporting	Any
07H	Define Macro Encoded Message	Any
08H	Macro Encoded Message	Any
09H	Data Transmission	Any
0AH	Download DNID	Any
0BH	Delete DNID	Individual
0C – 3FH	Reserved	
40 - 7FH	User defined	Any

1) Send Unreserved Report as required in “Response” (00H)
MES responds as defined in the “Response” field. When Nera Mini-C/Nera C receives this polling, the data set by “Report Length” in “Data Report” ([F5][1]) is reported once.

2) Program Reserved Data Reporting (01H)
This command is used by the “Pre-assigned Data Reporting” protocol.

The parameters to be pre-programmed are;

- DNIS
- LES ID
- Member number
- Logical channel number

- Starting frame number
- Slot number
- Number of packets per report
- Reporting interval
- Assignment duration

3) Initiate Reserved Data Reporting (02H)
Data reporting is initiated using the Pre-Assigned Data Reporting protocol. An MES with programmed pre-assigned data reporting restart its programming on receipt of an "initiate" poll if it is had previously received a "stop" Pre-assigned Data reporting poll.

4) Stop Reserved Data Reporting (03H)
This command is used to stop Pre-assigned Data Reporting. The sub-address in the header indicates which device is to stop reporting.

5) Program Unreserved Data Reporting (04H)
This command is used to program regular reporting by means of the Unreserved Data Reporting ("Inmarsat-C Sloted Aloha access") protocol.
The parameters to be pre-programmed are:

- DNID
- LES ID
- Member number
- Logical channel number
- Starting frame number
- Reporting interval

When Nera Mini-C/Nera C receives this polling, the data set by "Report Length" in "Data Report" ([F5][1]) is sent.

6) Initiate Unreserved Data Reporting (05H)
This command is used to programmed Unreserved Data Reporting.

7) Stop Unreserved Data Reporting (06H)
This command is used to stop programmed Unreserved Data Reporting.

8) Define Macro Encoded Message/Macro Encoded Message (07H/08H)
These commands are for special applications defined by Inmarsat. Nera Mini-C/Nera C does not support these commands, but it sends acknowledgement only when received.

9) Data Transmission (09H)
The Text field is available for use by the user and is treated as byte oriented binary data. Nera C/Nera Mini-C does not support these commands, but it sends acknowledgement when received.

10) Download DNID (0AH)
This command is used to download a DNID. The MES stores five parameters associated with a DNID:

- DNID
- Sub-Address
- LES ID
- Member number contained in Text field (1 to 255)
- First 25 characters of the [Free] field “Operator” of the DNID.

11) Delete DNID (0BH)
This command is used to delete a DNID existing in an MES.

Example of DNID downloading

```
Data Network ID List ( Printed at 03-03-27 04:13 )

No.      DNID    LES    Subaddr   Member   Text
01    *  09268   212      000       057    KCCM12
02    *  05592   201      000       057    KCCM
03    *  15004   203      000       040    GYOGYOU SERVICE
```

Example of “Send Unreserved Report” polling

```
POLLING Message    --- Send Report ---
DNID          : 05592    LES ID        : 201(SANTA PAULA)
Sub Address   : 001      Member Number: 067    Response : Data Report
Receive Date & Time : 03-04-15    20:31 (UTC)
```

```
Data Reported (Poll Response)

LES           : SANTA PAULA          Date          : 03-04-15
DNID          : 05592                Time          : 20:31 (UTC)
Member No.    : 67

Position      LAT   43:18.19N       Water Temp       -----
              LON  145:35.45E       Water Current    ----- KTS
Course        345.4                                  -----
Speed           0.0 KTS             Depth            -----
```

```
03-04-15 20:39 (UTC)
Successful Data Report Sending.
```

AP1.2.3 Data Reporting Packet

Fig.1.2.2 shows the packet formats used for Data Reporting.

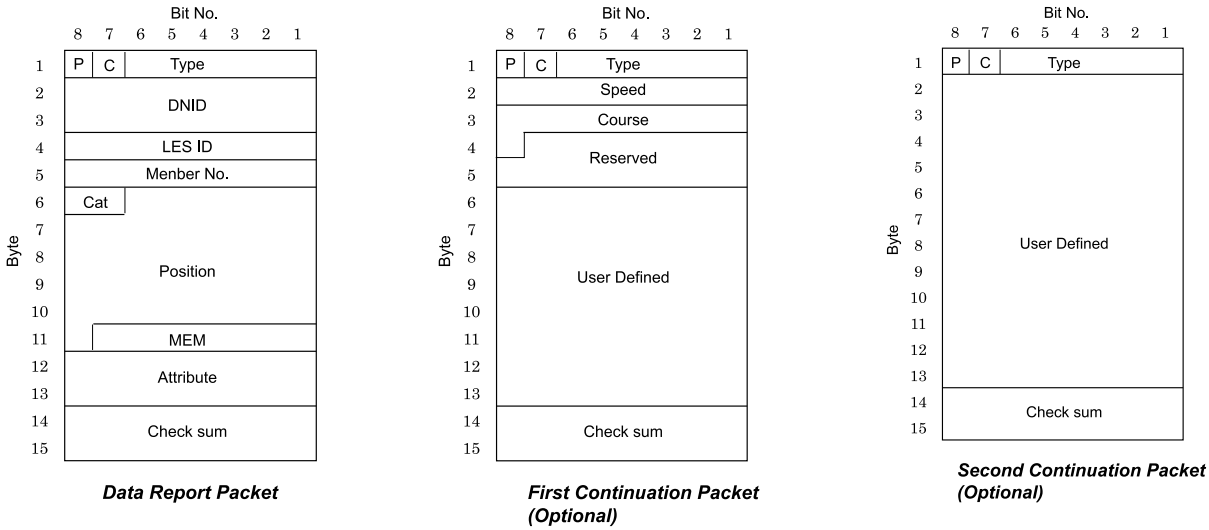


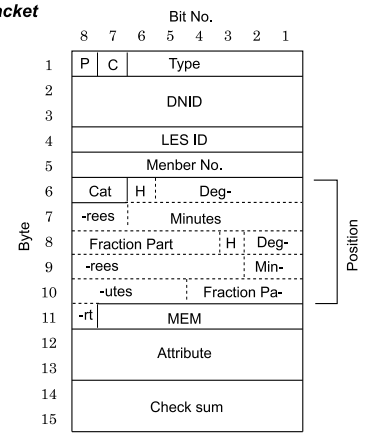
Fig.1.2.2 Data Reporting Packet format

Table 1.2.5 Data Reporting Packet format

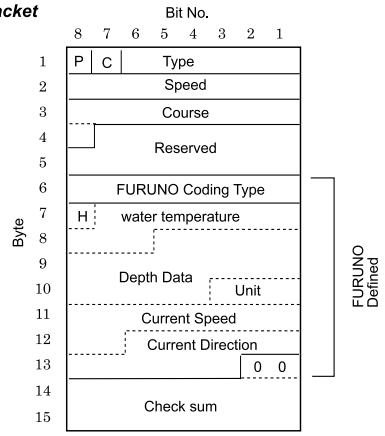
Signal name	Bits	Description
P	1 bit	Priority; All packet types have normal priority (0) except for the Assignment Request and Distress Alert packets which may also have distress priority.
C	1 bit	Continuation bit, indicating if there is a subsequent packet; 0: Last packet in sequence; 1: Another packet to follow.
Type	6 bits	Type field is set to 04H (Data Report).
LES ID	1 byte	Identifies the LES to which the report is to be transmitted.
DNID	2 bytes	Gives the closed network address to be used when sending a Data Report.
Member No.	1 byte	A number uniquely identifying the MES within the group defined by DNID and LES ID.
Cat (Category)	2 bits	This field is used to specify the report category. The category is Land Mobile Position Report (00B), Maritime Position report (01B), Extended (10B) or Spar (11B). When the category is set to “Extended” (10B), “Sub-Category” (6 bits) follows. Sub-Category is POLL Ack (00H), Reserved (01H-2FH) or User defined (30H-3FH).
Position	39 bits	Shows Longitude and Latitude.
MEM (Macro Encoded Message)	7 bits	A MEM is a pre-defined message represented by a unique 7 bit code; 00H to 3FH. Normally, 0BH code is transmitted.
Attribute	16 bits	Normally, time data is set.
Speed	1byte	Binary data of 0.2 knot unit. “FFH” means no data.
Course	9 bits	Binary data of 1 knot unit. “1FFH” means no data.
Reserved	15bits	Not used. 0 is set.
User Defined		Shows user defined data. To save the data, new application is necessary. 10 bytes of First packet and 12 bytes of Second packet are available.

Transmitted Packet contents set in "Data Report" ([F5])

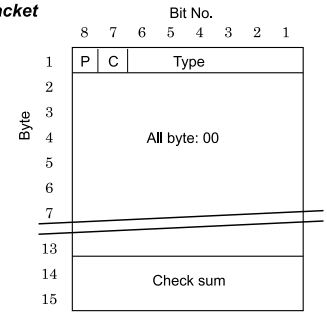
1st Packet



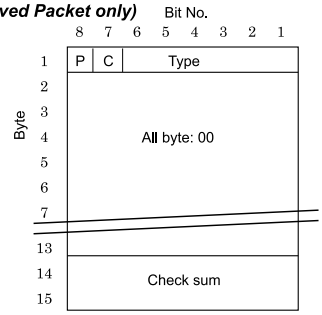
2nd Packet



3rd Packet



4th Packet
(Reserved Packet only)



LAT
- H (1 bit) : 0=North, 1=South
- Degrees (7 bits) : 1deg. step 0-90
- Minutes (6 bits) : 1mini. step 0-59
- Fraction (5 bits) : 0.04min. step 0-24

LON
- H (1 bit) : 0=East, 1=West
- Degrees (8 bits) : 1deg. step 0-180
- Minutes (6 bits) : 1mini. step 0-59
- Fraction (5 bits) : 0.04min. step 0-24

Macro Encoded Message (7 bits): $0B_H$

Attribute (16 bits) : UTC of position

Speed/Course
- Speed (8 bits) : 0.2knots step 0-254
- Course (9 bits) : 1deg. Step 0-359

Reserved (15 bits) : All bits=0

Nera Coding Type (8 bits): 01_H

Water Temperature
- H (1 bit) : 0=+, 1=-
- Degree (10 bits) : 0.1deg. step 0-1022

Depth Date
- Depth Date (18 bits) : 0.1 step 0-262142
- Unit (3 bits) : m, Feet, Fathom, --

Current Data
- Current Speed (10 bits): 0.1knots step 0-1022
- Current Direction (12 bits): 0.1deg. step 0-3599

AP1.3 KDDI Polling Service

Fig.1.3.1 shows an example of a polling request for data report about the group of DNID 12345 from a ship. “poll@satmailc.com” is typed in the “address (TO)” field, polling command parameters in the “SUBJECT” field, and User ID and password in the message field. USERID is JPAX9999 and PASSWORD KDDI.

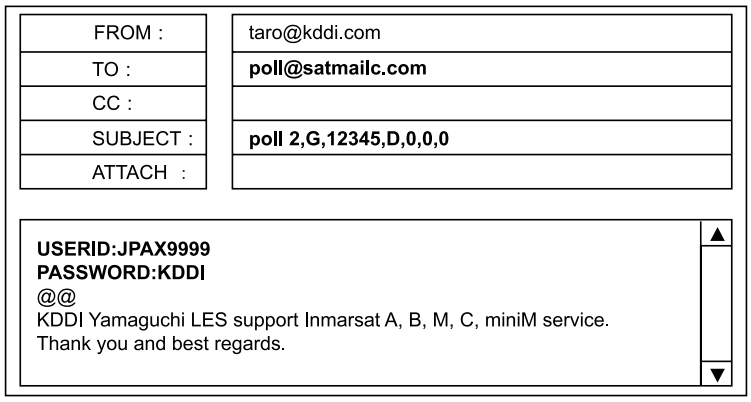


Fig.1.3.1 Polling request

Fig.1.3.2 shows an example of the data report from the ship in response to the polling request. Nothing appears in the SUBJECT line in data reporting. The “sender” is identified by the Member Number in “FROM” field. In the example of Fig.1.3.2, the member number is 1.

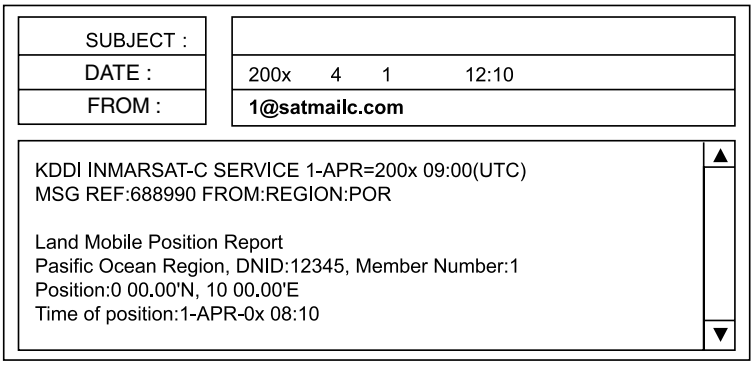


Fig.1.3.2 Data Report responding to polling

AP1.3.1 KDDI Polling commands

A poll command must be followed by some parameters: POLL (Space) P1, P2, P3, P4, P5, P6, P7, P8, P9, P10.
Generally, parameters P1 to P6 are used. For program polling, parameters up to P9 are used. P10 is used to require answer confirmation. A parameter cannot be omitted. If it is not necessary, enter the default value.

Command Form;
Polling Command_P1,P2,P3,P4,P5,P6,P7,P8,P9,P10

Table 1.3.1 KDDI polling commands

Name	Contents	Example	Description
Polling command	Instructions command	poll	Polling command
Ocean region code	Ocean region code	0	0: Atlantic Ocean West 1: Atlantic Ocean East 2: Pacific Ocean 3: Indian Ocean
P1	Poll type code	G	G: Group Poll – Polling of a group with the same DNID. I: Individual poll – Polling of individual Inmarsat-C terminal. N: Area poll, Navarea – Polling of an ocean region specified by Navarea W: WMO area poll, Navarea - Ocean region specified by WMO R: Area poll Rectangular – Specified ocean region (rectangular shape) C: Area poll, Circular – Specified ocean region (circular shape)
P2	Data Network ID code	12345	DNID: 5 digits
P3	Response type code	D	D: Request for a response from ship(s) by Data Reporting M: Request for a normal message response N: No response necessary
P4	Sub address code	0	0 to 255 is entered. Usually the default value of “0” (zero) is entered.
P5*[1]	Address code	0	0: Group Poll (When P1 is G) 9 digits – Inmarsat C Mobile Number: Individual Poll (When P1 is I) Up to 2 digits – Ocean region as designated by Navarea is entered using Arabic numerals: Navarea Poll (When P1 is N) 12 digits – Ocean region as designated by a rectangle: Rectangular area Poll (When P1 is R) 10 digits – Ocean region as designated by circle: Circular area Poll (When P1 is C)
P6	Command type code	0	0: Command is transmitted and a data report is requested 4: Set program parameters (Sets P8 and P9 codes). 5: Start program 6: End program 9: Only command is transmitted; no data report is requested.

P7	Member Number code	015	Up to 3-digit member number: The Member Number is entered only in cases where the P1 Code is set to "l". In other cases, enter the default value of "1" (one).
P8*2	Code for Setting of the Program start	0000	4-digit frame number: The program start time is set by using a 4-digit frame number only when "4" (program parameter setting) is selected for the P6 code. In all other cases, enter the default value of "0" (zero).
P9*3	Code for Setting of the transmission Time Interval (for Data Reporting)	10	1 to 500: A number between 1 to 500 is set as the data reporting transmission time interval only when "4" (program parameter setting) is selected for the P6 code. In all other cases, enter the default value of "10" (ten).
P10*4	Acknowledgement code	0	1: Answer confirmation is required. 2: Answer confirmation is not required.

*1: 12 digits – Ocean region designated by a rectangle: example "56S010E22010" (Range of 34 to 56 South and 20 to 10 East)
10 digits – Ocean region designated by circle: example "56N025W123" (Circular area with a radius of 123 miles with its center at 56 North, 25 West)

*2: "0000" indicates UTC and "0001" indicates a time 8.64 seconds later. When the desired program start time is HH hrs. and mins., the following formula should be used to calculate the frame number.

$$(HH \times 3600 + MM \times 60)/8.64$$

*3: Designation of P9
The maximum setting for the transmission time interval is 1 day (24 hours). In this case, enter "1" (one). In the case of twice a day, i.e., every 12 hours, enter "2", and for 3 times a day, i.e., once every 8 hours, enter "3". A setting of up to 500 times a day (once every 172.8 seconds) is possible.

*4: This setting is for acknowledgment of reception of Polling commands by the Inmarsat C terminal.

1) Example of Group Polling command

(1) POLL 2, G, 19999, D, 0, 0, 0

Requesting position report from ships of DNID, 19999 located in POR.

(2) POLL 3, G, 19999, D, 0, 0, 0, 1, 0, 10, 1

Requesting position report from ships of DNID, 19999 located in POR. The acknowledgement is also required.

2) Example of Individual polling command

(1) POLL 2, I, 19999, D, 0, 499999999, 0

Requesting position report from ship of DNID, 19999 and IMN, 499999999 located in POR.

(2) POLL 3, I, 1999, D, 0, 499999999, 0, 1, 0, 10, 1

Requesting position report from ship of DNID, 19999 and IMN, 499999999 located in POR. The acknowledgement is also required.

3) Example of Group program polling command (Daily report)

The position report is required daily from POR DNID 19999 at 15:00 (JST).

Step-1)

Program command : POLL 2, G, 19999, D, 0, 0, 4, 1, 2500, 1, 0

Step-2)

Start command : POLL 2, G, 19999, D, 0, 0, 5

** The command that stop the position report is as follows. **

Stop command : POLL 2, G, 19999, D, 0, 0, 6

4) Example of Individual program polling command (Daily report)

The position report is required daily from POR DNID 19999, IMN 499999999 at 09:00 (JST).

Step-1)

Program command : POLL, 2, I, 19999, D, 0, 499999999, 4, 1, 0000, 1, 0

Step-2)

Start command : POLL 2, I, 19999, D, 0, 499999999, 5

** The command that stop the position report is as follows. **

Stop command : POLL, 2, I, 19999, D, 0, 499999999, 6

AP1.4 Vessel Monitoring System (VMS)

AP1.4.1 General

There are four VMS (Vessel Monitoring System) versions of FNera C/Nera Mini-C: Forum Fisheries Agency (FFA), Norwegian, Russian and Nippon Yusen (Japanese).

With VMS software;

1) The setting is overwritten when the same DNID is received during programmed reporting. The system must be turned off and on again.
2) Programmed reporting stops when the ship moves into new ocean region and at logout. The reporting restarts automatically when the ship comes back in the ocean region where the report was being made and at next login.
3) To keep reporting even if the ocean region changes, the ship must be registered with another DNID for new ocean region.

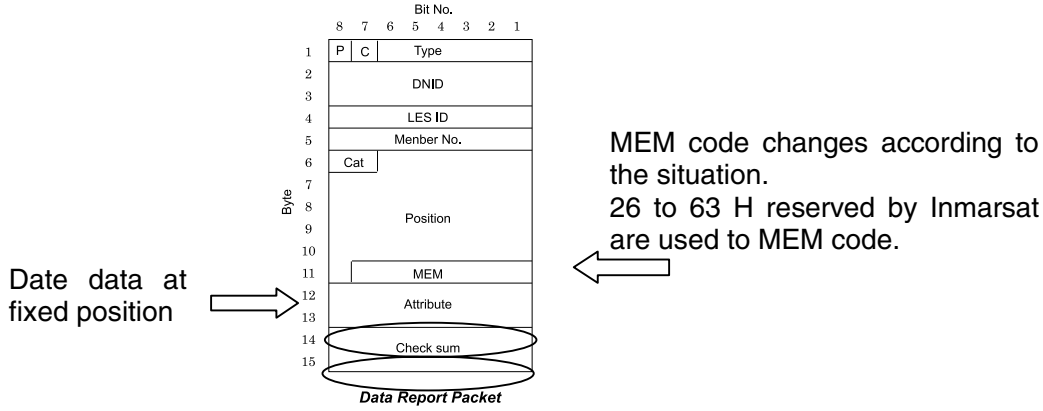


Fig.1.4.1 Data Reporting packet

AP1.4.2 Functional comparison

1) Setup Software
   Setup software requires following settings.

   - FFA : 1. Sub-address, 2. Status
   - Norwegian : 1. Sub address, 2. Status, 3. Next Report Time,
     4. Normal Interval,
     5. Reduced Interval (15 minutes to 6 hours), 6. DNID (6 presets)
   - Russian : 1. Sub-address, 2. Packets
   - Nippon Yusen : 1. Sub-address, 2. Status

2) Report at first DNID downloading
   - FFA : First Position Report (MEM40H) is transmitted.
   - Norwegian : None
   - Russian : None
   - Nippon Yusen : None

3) DNID preset
   - FFA : None
   - Norwegian : Up to six DNID is set by using Setup software.
   - Russian : None
   - Nippon Yusen : None

4) DNID valid/invalid setting
   - FFA : DNID cannot be set to invalid.
   - Norwegian : Same as FFA. When [Enter] is pressed, "*" disappears from the list, but it reappears when the list is opened again.
   - Russian : Same as Norwegian.
   - Nippon Yusen : DNID can be set to invalid.

5) Automatic login and first position report (At power-on)
   - FFA : Automatic login and First Position Report (MEM40H) is sent.
   - Norwegian : Same as FFA.
   - Russian : Automatic login (No first position report)
   - Nippon Yusen : None

6) Last position report (At logout)
   - FFA : Last Position Report (MEM42H) is sent.
   - Norwegian : Same as FFA.
   - Russian : None
   - Nippon Yusen : None

7) Last position report (At power-on)
   When power is shut down during login;
   - FFA : Last Position Report (MEM42H) and First Position Report (MEM40H) are sent at power-on.
   - Norwegian : Same as FFA.
   - Russian : Automatic login only at next power-on.
   - Nippon Yusen : None.

8) Antenna disconnection/blockage report
- FFA : When the system is synchronized after unsynchronization for more than 5 minutes, Antenna Disconnected Position Report (MEM44H) is sent if GPS does not receive the signal, and Antenna Blocked Position Report (MEM45H) is sent if GPS receives the signal.
   - Norwegian : Same as FFA
   - Russian : Nothing happens.
   - Nippon Yusen : Nothing happens.

9) When Position report cannot be sent
   - FFA : Nothing happens.
   - Norwegian : Polled position is memorized. After normal condition is resumed, the current position report is sent, followed by memorized positions from the oldest one. (Stored Position Report: MEM 46H)
   - Russian : Nothing happens.
   - Nippon Yusen : Nothing happens.

10) Reduced of transmission mode report
   - FFA : None
   - Norwegian : When position change is within 400 m for 3 hours, Enter Reduced Transmission Mode Report (MEM55H) is sent and the position is checked every 5 minutes.
     Further, when position change is more than 400 m for 5 minutes, Leave Reduced Transmission Mode Report (MEM57H) is sent.
     In Reduced Transmission mode Position Report (MEM56H) is sent at the interval set by using setup software (6 hours or less) in Reduced Transmission mode.
   - Russian : None
   - Nippon Yusen : None

11) User Defined Field in Packet 2
   - FFA : Not specified
   - Norwegian : Nothing included.
   - Russian : Not specified
   - Nippon Yusen : Main engine revolution and horsepower

12) Ring buffer
   - FFA : None
   - Norwegian : The buffer can store 24 Reported Position data. When polled (Command type: 00H), a requested one is sent. The data is specified by “1nn” in the text field. For example, 123 means twenty third data is requested to be transmitted.
   - Russian : None
   - Nippon Yusen : None

13) NAV data
   - FFA : Built-in GPS
   - Norwegian : Same as FFA
   - Russian : Same as FFA
   - Nippon Yusen : Internal or External GPS

14) Date data
- FFA : Built-in GPS
- Norwegian : Same as FFA
- Russian : Same as FFA
- Nippon Yusen : Internal or External GPS

15) EGC mode
- FFA : Not selectable
- Norwegian : Not selectable
- Russian : Not selectable
- Nippon Yusen : Selectable

16) Status display during data reporting
- FFA : Only MES Status Busy appears in current state line
- Norwegian : Same as non-VMS version, except for no printing
- Russian : Same as non-VMS version
- Nippon Yusen : Same as non-VMS version

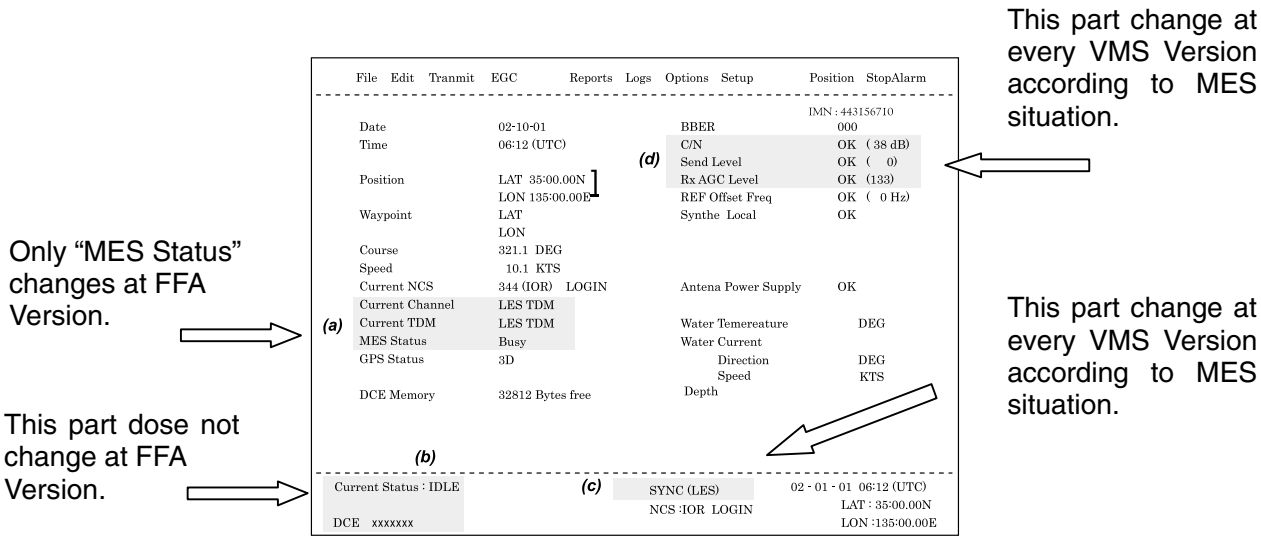


Fig.1.4.2 Change of Status window at reporting

MEM codes

The following table summarizes the MEM (Macro Encoded Message) codes used in various position reports:

MEM	Description
0BH	Time of Position Report
40H	Power Up Report (First Position Report)
42H	Power Down Report (Last Position Report)
44H	Antenna Disconnection Position Report
45H	Antenna Blockage Position Report
46H	Stored Position Report
55H	Enter Reduced Transmission Mode Report
56H	In Reduced Transmission Mode Report
57H	Leave Reduced Transmission Mode Report

AP1.4.3 VRM System Selection

Following describes how to configure VMS with setup software.

Note)
Once VMS mode is set to ON, it cannot be set to OFF.
Ask Nera to disable VMS mode.

Nera C: Setup from Nera C Terminal unit

1. Set the VMS setup program floppy disk, ***No.1650179-01.0x*** to the floppy disk drive of the terminal unit.

2. Turn on the system.

3. The following message appears.
   FD Boot Ver 1.03
   VMS Report Setup
   Loading: RPTSETUP.BIN ---- *x sec* ***(Count down: 30 sec -→ 0 sec)***

   VMS Data Report Setup Program
   Version 3.1 2003/07/25

4. Go to step “6” of procedure in [Nera C/Nera Mini-C: Setup from PC].

Nera C/Nera Min-C: Setup from PC

1. Connect a PC to [DTE] port on Nera Min-C.

2. Run DOS program on the PC. If DOS is other than US mode, type **US**, followed by [Enter].

3. Insert the VMS setup floppy disk into the drive.

4. Type **A:Enter** to change the active drive to A.

5. Type xxxxxxxx n (password plus COM port number (n) to be used), followed by [Enter]. The password display appears.
   ** If it does not designate the port number, the port number is set in COM-1.

6. Enter a VMS password, followed by [Enter].

Version	Password
FFA	xxx xxxx
Russian	xxx xxxxxx
Norwegian	xxxxxx
Nippon Yusen	xxx

The following message appears.

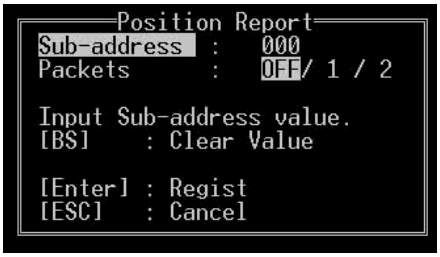
Once VMS Report is turned on, it is impossible to be turned off.
<< Press ESC key to Closs >>

Then press [ESC] key, setup display appears.

FFA VMS

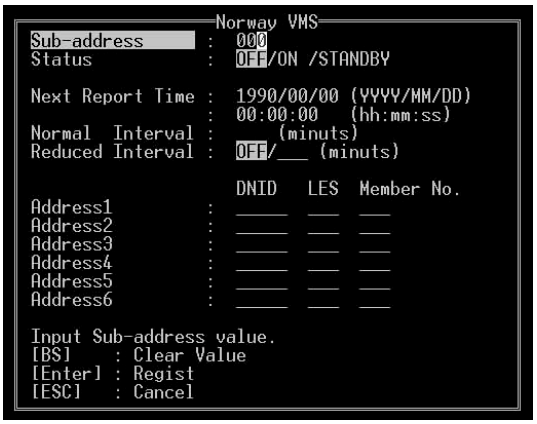
Leave “Sub-address” with 000.
When “Status” is ON, FFA VMS is activated.
FFA VMS uses polling commands:
00H: Send Unreserved Report as required
04H: Program Unreserved Data Reporting

Russian VMS



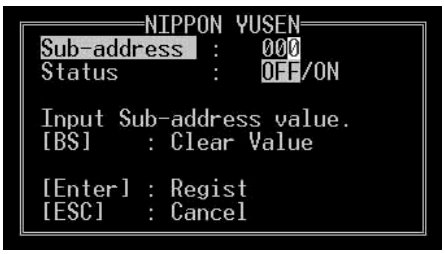
Leave “Sub-address” with 000.
“Packets” setting:
OFF: VMS OFF
1: Position report only
2: Position, course and speed reports
Russian VMS uses poling commands:
00H: Send Unreserved Report as required
04H: Program Unreserved Data Reporting

Norwegian VMS


Norway VMS
Sub-address : 000
Status : OFF/ON /STANDBY
Next Report Time : 1990/00/00 (YYYY/MM/DD)
: 00:00:00 (hh:mm:ss)
Normal Interval : (minuts)
Reduced Interval : OFF/___ (minuts)
DNID LES Member No.
Address1 : _____ ___ ___
Address2 : _____ ___ ___
Address3 : _____ ___ ___
Address4 : _____ ___ ___
Address5 : _____ ___ ___
Address6 : _____ ___ ___
Input Sub-address value.
[BS] : Clear Value
[Enter] : Regist
[ESC] : Cancel

Items to be set		Description
Sub-address		Set to “000”.
Status	OFF	VMS is OFF.
	ON	VMS is ON.
	STAND BY	The status is set to ON by polling.
Next Report Time		Used to set automatic Report starting time without polling
Normal Interval		Used to set automatic Report interval without polling
Reduced Interval		See page AP1-24.
Address 1-6		DNID, LES and Member No. are entered for the destination of the report.

Nippon Yusen



Leave “Sub-address” with 000.
When “Status” is Nippon Yusen VMS is activated.
Nippon Yusen VMS uses polling commands:
00H: Send Unreserved Report as required
04H: Program Unreserved Data Reporting

7. After completing settings, press [Enter].

8. Press [ESC] to terminate the setup program. When the DOS prompt display appears on the PC, turn off the system (terminal unit/communication unit) and on it again.

9. Confirm that message below appears at the lower left-hand of the status display.

Version	Message
FFA	DCE F16(15) Ver-xx + FFA
Russian	DCE F16(15) Ver-xx + VMS
Norwegian	DCE F16(15) Ver-xx + NOR
Nippon Yusen	DCE F16(15) Ver-xx + NYK

AP1.5 Message Report

AP1.5.1 Setting

Using the terminal unit, Nera Mini-C/Nera C features Message Report via the message channel on which a telex message is sent. The report is made through “Message Report” in Reports menu ([F5][2]).

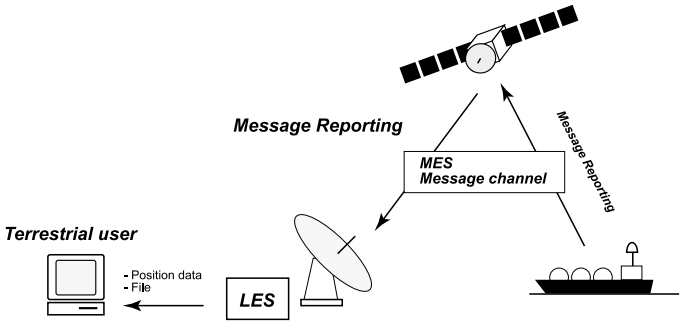
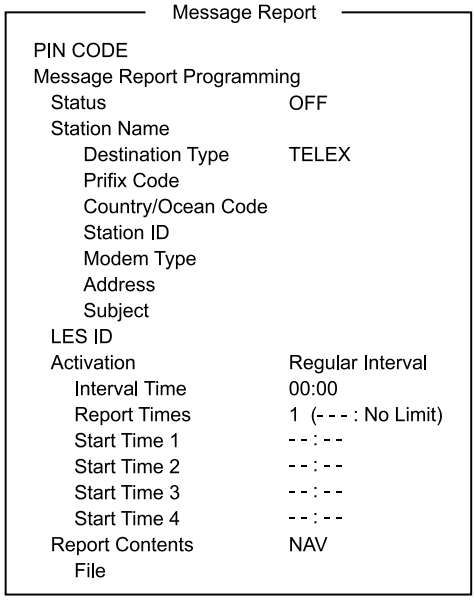
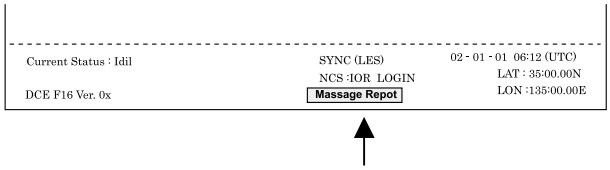


Fig.1.5.1 Message Reporting





When [Status] is set to ON, “Massage Report” is displayed in reversed video and reporting starts.

Fig.1.5.2 Message Report setting display

Table 1.5.1 lists items in Data Report menu ([F5][1]).

Table 1.5.1 Data Report setting items

Items to be set	Description
PIN CODE	Reporting starts according to the polling command when PIN CODE in the polling command is the same as that of setting by this menu. Up to 8 characters can be designated.
Status	ON: Starts Message Report according to the parameter.
	OFF: Stops Message Report.
Station Name	Inputs transmitting type and station number.
LES ID	Inputs LES ID.
Activation	Regular Interval: Reports according to the reporting interval set through “Interval Time” and the reporting frequency set through “Report Times”.
	Daily: Reports every day.
Interval Time	When “Activation” is set to “Regular Interval”, the reporting interval is more than 10 minutes.
Report Times	When “Activation” is set to “Regular Interval”, the reporting frequency is from 1 to 999.
	No Limit: When the reporting frequency is not limited.
Start Time 1 to 4	When “Activation” is set to “Daily”, set the reporting time. Up to 4 times a day can be set.
Report Contents	NAV: Position report, speed and course
	NAV(R): Position report, speed and course. Simple format.
File	Selects the file to be transmitted.

AP1.5.2 Message Reporting by Polling Command

Message report is sent by receiving a polling command which includes the same PIN Code as that set on the MES.

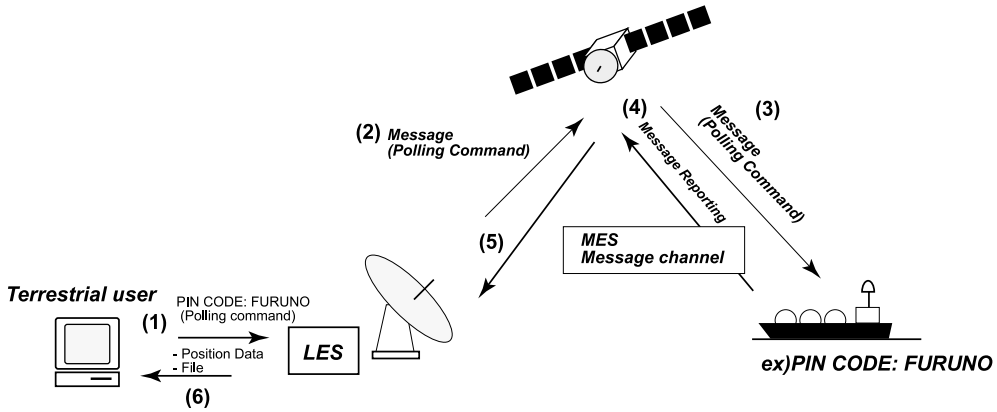


Fig.1.5.3 Message Reporting by Polling Command

PIN code is assigned to each "Message Report" menu, 1 to 4. The code is up to 8 character long. Polling command is written at the top of the text, following additional message after one blank line.
To execute the setting in Message Report menu remotely, send a poll command: "D???-PINCODE-filename:". The PIN code in the command is the same one in the Message Report menu you selects. File names with and without extension can be specified, but the selected file should exist in the current directory.

Polling command
Polling commands always ends with a colon (:). The element underlined is prefixed. If only position, speed, and course are required in the report, the file name is not entered.

1) TELEX
   P???/PIN CODE/TELEX/LES ID/Country Ocean Code/Station ID/file name:

2) PSTN
   P??? /PIN CODE/PSTN/modem type/LES ID/Country Ocean Code/
   Station ID/file name:

Selectable modem types are T30, V21, V22B, V22, V23, V26B, V26T, V27T and V32.

3) PSDN
   P???/PIN CODE/PSDN/LES ID/Country Ocean Code/Station ID/file name:

4) DNID
   P???/PIN CODE/DNID/LES ID/Station ID/file name:

5) FAX
   P???/PIN CODE/FAX/LES ID/Country Ocean Code/Station ID/file name:
6) E-mail
   P???/PIN CODE/EMAIL/LES ID/mail address/file name:

7) TELEX with SPEC number
   P???/PIN CODE/SPEC/LES ID/Station ID/file name:

Example of Polling Command

When the land subscriber requires the MES (PIN code: 12345678) navigating in Pacific Ocean (203) to e-mail position, speed, and course data to abc@satcom.nera.no via KDDI, use the poll command:

P???/12345678/EMAIL/203/abc@satcom.nera.no:

To request the MES to send “REPORT.TXT” file in current directory “MSG”, send the following polling command.

“P???/12345678/EMAIL/203/abc@satcom.nera.no/REPORT.TXT:”

Appendix 2) Menu Tree

The table below lists the menu tree. Factory default setting is screened.

Function	Menu-1	Menu-2	Menu-3	Menu-4
F1: File	1. New *(Alt + N)*			
	2. Open *(Alt + O)*			
	3. Close *(Alt + Q)*			
	4. Save *(Alt + S)*			
	5. Delete *(Alt + D)*			
	6. Rename			
	7. Print *(Alt + P)*			
	8. Print setting	No print		
		Windows printer		
		PP-510		
	9. MIME (Decode)			
F2: Edit	1. Cut *(DEL)*			
	2. Copy *(Alt + C)*			
	3. Paste *(INS)*			
	4. Insert			
	5. Select All *(Alt + A)*			
	6. Search or Replace	1. Search *(Alt + F)*	Search Word	
			Direction	Forward
				Back
		2. Replace *(Alt + R)*	Search Word	
			Replace Word	
			Direction	Forward
				Back
			Query or All	Query
				All
	7. Go to Line	1. Top of Text *(HOME)*		
		2. End of Text *(END)*		
		3. Go to Line	Line No.	
	8. Time or Pos. Ins.	1. Time		
		2. Position		
	9. Change Window *(Alt + V)*			

.

Function	Menu-1	Menu-2	Menu-3	Menu-4
F3: Transmit (Cont'd)	1. Transmit Message (Cont'd)	Message File	Select File	
		Station Name	Station List	
		Destination Type	Distention Type	TELEX
				FAX
				E-Mail
				CSDN
				PSDN
				X400
				DNID
				SPEC
				TELEX (Prefixed)
				FAX (Prefixed)
				PSDN (Prefixed)
				X400 (Prefixed)
				DNID (Prefixed)
				SPEC (Prefixed)
			Prefix code *(Set when Prefixed item is selected in Destination Type menu.)*	
			Country/Ocean Code	
			Station ID	
			Modem Type *(Set when FAX or FAX (Prefixed) is selected in Destination Type menu.)*	T30 FAX
				V21 V.21 300bps Duplex
				V22 V.22 1200bps Duplex
				V22B V.22bis 2400bps Duplex
				V23 V.23 600/1200bps
				V26B V.26bis 2400/1200bps
				V26T V.26ter 2400bps Duplex
				V27T V.27ter 4800/2400bps
				V32 V.32 9600bps Duplex
				Other
			Address *(Set when E-Mail is selected in Destination menu.)*	
			Subject *(Set when E-Mail is selected in Destination menu.)*	
			Attach File *(Set when E-Mail is selected in Destination menu.)*	

Function	Menu-1	Menu-2	Menu-3	Menu-4
F3: Transmit	1. Transmit Message	LES ID	Select LES *(Except for E-mail and DNID)*	
		Option	Confirmation	ON
				OFF
			Send Delay	
			Delivery Delay	Immediate
				Deferred
			Code	IA5
				ITA2
				DATA
		Transmit	Yes	
			No	
	2. Cancel			
	3. Request Delivery Status			
F4: EGC	1. Display EGC Message			
	2. EGC Network ID			
F5: Reports (Cont'd)	1. Data Report	1. Data Report 2. Data Report 3. Data Report 4. Data Report	Status	ON
				OFF
			Report Length	1
				2
				3
			Destination	DNID
				LES ID
				Member No.
			Activation	Regular Interval
				Daily
			Interval Time *(Set when Regular Interval is selected in Activation menu.)*	
			Report Times *(Set when Regular Interval is selected in Activation menu.)*	
			Start Time 1 *(Set when Daily is selected in Activation menu.)*	
			Start Time 2 *(Set when Daily is selected in Activation menu.)*	
			Start Time 3 *(Set when Daily is selected in Activation menu.)*	
			Start Time 4 *(Set when Daily is selected in Activation menu.)*	

Function	Menu-1	Menu-2	Menu-3	Menu-4
F5: Reports (Cont'd)	2. Message Report (Cont'd)	1. Message Report 2. Message Report 3. Message Report 4. Message Report (Cont'd)	PIN Code	
			Status	ON
				OFF
			Station Name	
			Destination Type	TELEX
				FAX
				E-Mail
				CSDN
				PSDN
				X400
				DNID
				SPEC
				TELEX (Prefixed)
				FAX (Prefixed)
				PSDN (Prefixed)
				X400 (Prefixed)
				DNID (Prefixed)
				SPEC (Prefixed)
			Prefix code *(Set when Prefixed code is selected in Destination Type menu)*	
			Country/Ocean Code	
			Station ID	
			Modem Type *(Set when FAX or FAX (Prefixed) is selected in Destination Type menu.)*	T30 FAX
				V21 V.21 300bps Duplex
				V22 V.22 1200bps Duplex
				V22B V.22bis 2400bps Duplex
				V23 V.23 600/1200bps
				V26B V.26bis 2400/1200bps
				V26T V.26ter 2400bps Duplex
				V27T V.27ter 4800/2400bps
				V32 V.32 9600bps Duplex
				Other
			Address *(Set when E-Mail is selected in Destination Type menu.)*	
			Subject *(Set when E-Mail is selected in Destination Type menu.)*	

Function	Menu-1	Menu-2	Menu-3	Menu-4
F5: Reports	2. Message Report	1. Message Report 2. Message Report 3. Message Report 4. Message Report	LES ID	
			Activation	Regular Interval
				Daily
			Interval Times *(Set when Regular Interval is selected in Activation menu.)*	
			Report Times *(Set when Regular Interval is selected in Activation menu.)*	
			Start Time 1 *(Set when Daily is selected in Activation menu.)*	
			Start Time 2 *(Set when Daily is selected in Activation menu.)*	
			Start Time 3 *(Set when Daily is selected in Activation menu.)*	
			Start Time 4 *(Set when Daily is selected in Activation menu.)*	
			Report Contents	NAV
				NAV (R)
				FILE
			File *(Set when FILE is selected in Report Contents menu.)*	
	3. Data Network ID			
F6: Logs	1. Send Message Log			
	2. Receive Message Log			
	3. EGC Log			
	4. Log			

Function	Menu-1	Menu-2	Menu-3	Menu-4
F7: Option	1. Log in	Yes		
		No		
	2. Log out	Yes		
		No		
	3. Abort	Yes		
		No		
	4. Select NCS	AOR (WEST)		
		AOR (EAST)		
		POR		
		IOR		
	5. Ocean Region	Auto	Yes	
			No	
		West-Atlantic	Yes	
			No	
		East-Atlantic	Yes	
			No	
		Pacific	Yes	
			No	
		Indian	Yes	
			No	
	6. LES Information			
	7. Test	1. PV Test	Yes	
			No	
		2. PV Test Result		
		3. Diagnostics Test	Yes	
			No	
F8: Set up (Cont'd)	1. System Setup	System Date & Time		
		IMN		
		MES Operation Mode	INMARSAT-C	
			EGC	
		Command Window *JOB: NERASERVICE* *Password:* *Nera C* *Nera Mini-C*	1. Remote Box Setup	1. DMC (ON/OFF)
				2. IC-305 (ON/OFF)
				3. IC-306 No.1 (ON/OFF)
				4. IC-306 No.2 (ON/OFF)
				5. IC-306 No.3 (ON/OFF)
				E: EXT
			2. Internal GPS Setup	1. Data Output Interval (01 – 30 sec)
				E: EXT

Function	Menu-1	Menu-2	Menu-3	Menu-4
F8: **Set up** (Cont'd)	2. Editor Setup *(At closed file.)*	Text Mode	Telex	
			Ascii	
		Edit Mode	Insert	
			Overwrite	
		Word Wrap	ON	
			OFF	
		Line No.	ON	
			OFF	
		Tab Wide	2 Char	
			4 Char	
			8 Char	
		Column width	69 Telex: 69 fix ASCII: 40-80	
		Cursor Type	Block	
			Underline	
		Scroll	Full Screen	
			Half Screen	
	3. Terminal Setup (Cont'd)	Date Disp. Form	YY – MM - DD	
			MMM - DD - YY	
			DD - MMM - YY	
		Currency Unit	SDR	
			US$	
			EUR	
			YEN	
			OTHER	
		Screen Saver	ON	
			OFF	

Function	Menu-1	Menu-2	Menu-3	Menu-4
F8: **Set up** (Cont'd)	3. Terminal Setup	Window Color	Window Color Setup	Window • *Base Window* • *RCV Message Display* • *EGC Message Display* • *EDIT 1* • *EDIT 2* • *Function* • *SUB Menu 1* • *SUB Menu 2* • *SUB Menu 3* • *SUB Menu 4* • *Message*
				For Color • *YELLOW* • *RED* • *CYAN* • *BLACK* • *L-WHITE* • *L-MAGENT* • *-L-RED* • *L-CYAN* • *L-GREEN* • *L-BLUE* • *GRAY* • *WHITE* • *BROWN* • *GREEN* • *BLUE*
				Back color • *L-WHITE* • *L-MAGENT* • *L-RED* • *-L-GREEN* • *L-BULE* • *GRAY* • *WHITE* • *BROWN* • *MAGENT* • *YELLOW* • *RED* • *CYAN* • *GREEN* • *BLUE* • *BLACK*
		Default Color	Yes	
			No	

Function	Menu-1	Menu-2	Menu-3	Menu-4
F8: **Set up** (Cont'd)	4. EGC Setup	Receive EGC Area	Additional Position	
			Navarea	
			Fixed Area	
		NAVTEX	Station Code	A-Z
			Ice Report	ON
				OFF
			Meteo. forecasts	ON
				OFF
			Pilot service	ON
				OFF
			DECCA message	ON
				OFF
			LORAN message	ON
				OFF
			OMEGA message	ON
				OFF
			SATNAV message	ON
				OFF
			Other navaid msg	ON
				OFF
			QRU (no message)	ON
				OFF
	5. Auto Mode Setup	Auto Log Print	ON	
			OFF	
		Receive Alarm	ON	
			OFF	
		Auto Receive Message Save	ON	
			OFF	
		Auto Receive Message Print	ON	
			OFF	
		Data Report & Polling Print	ON	
			OFF	
		Auto EGC Message Save	System	ON
				OFF
			Fleet NET	ON
				OFF
			Safety NET (Routine)	ON
				OFF
			Safety NET (Safety)	ON
				OFF
			Safety NET (Urgency & Distress)	ON
				OFF
		Auto EGC Message Print	System	ON
				OFF
			Fleet NET	ON
				OFF
			Safety NET (Routine)	ON
				OFF
			Safety NET (Safety)	ON
				OFF

Function	Menu-1	Menu-2	Menu-3	Menu-4
F8: **Set up** (Cont'd)	6. E-Mail Setup			
	7. Directories	Message Directory		
		EGC Message Directory		
	8. Configuration (Cont'd)	1. Station List (Max. 99 stations) (Cont'd)	Station Group	
			Station Name	
			Destination Type	TELEX
				FAX
				E-Mail
				CSDN
				PSDN
				X400
				DNID
				SPEC
				TELEX (Prefixed)
				FAX (Prefixed)
				PSDN (Prefixed)
				X400 (Prefixed)
				DNID (Prefixed)
				SPEC (Prefixed)
			Prefix code *(Set when Prefixed code is selected in Destination Type menu)*	
			Country/Ocean Code	
			Station ID	
			Modem Type *(Set when FAX or FAX (Prefixed) is selected in Destination Type menu.)*	T30 (FAX)
				V21 V.21 300bps Duplex
				V22 V.22 1200bps Duplex
				V22B V.22bis 2400bps Duplex
				V23 V.23 600/1200bps
				V26B V.26bis 2400/1200bps
				V26T V.26ter 2400bps Duplex
				V27T V.27ter 4800/2400bps
				V32 V.32 9600bps Duplex
				Other

Function	Menu-1	Menu-2	Menu-3	Menu-4
F8: Set up	8.Configuration	1. Station List (Max. 99 stations)	E-mail Address *(Set when E-Mail is selected in destination type.)*	
			Remark	
		2. LES List *(Max. 44 stations x 4)*	Name	
			ID	
			Remark	
			Charge	TELEX
				FAX
				E-Mail
				CSDN
				PSDN
				X400
				DNID
				SPEC
		3. EGC Channel List	Max. 4ch x 4	
		4. NCS Channel List	Max. 20ch x 4	
		5. E-Mail Service List *(Max. 16 stations)*	Service LES Name	
			Service ID	
			LES ID (AORW)	
			(AORE)	
			(POR)	
			(IOR)	
			To:	
			Cc:	
			Subject:	
			Separator	
			Attach File (MIME)	OFF
				ON (BASE64)
				ON (UUENCODE)
		6. Save/Load	Save to FD	1. ALL
				2. Station List
				3. LES List
				4. E-Mail Service List
				5. Other
			Load from FD	1. ALL
				2. Station List
				3. LES List
				4. E-Mail Service List
				5. Other
F9: Position	LAT			
	LON			
F10: Stop Alarm				

Appendix 3) LES service list

April 19, 2002

Land earth station operator	Country	AOR- E	AOR- W	IOR	POR
Beijing Marine	China			311	211
Bezeq	Israel	127		327	
CAT	Thailand			319	
CP Radio Marconi	Portugal	118			
Embratel	Brazil	114			
France Telecom	France	121	021	321	221
France Telecom (Ex DeteSat)	France	115		333	
KDDI	Japan	103	003	303	203
Korea Telecom	South Korea			308	208
Morviasputnik (Nudel Les)	Russia	117		317	
OTE	Greece	120		305	
Polish Telecom	Poland	116		316	
Saudi Telecom Co	Saudi Arabia	125		325	
Singapore Telecom	Singapore			328	210
Stratos Mobile Networks	Canada	102	002	302	202
Telecom Company of Iran	Iran			314	
Telecom Italia	Italy	105		335	
Telenor Satellite Services Inc	USA	101	001		201
Telenor Satellite Services AS	Norway	104	004	304	204
Turk Telecom	Turkey	110		310	
Vishipel	Vietnam			330	
VSNL	India			306	
Xantic	Netherlands	112	012	312	212
Xantic	Australia	122	022	322	222

Ocean Region	Telephone Ocean Region Access Code	Telex Ocean Region Access Code
AOR-W	874	584
AOR-E	871	581
POR	872	582
IOR	873	583

Appendix 4) Specifications

1. GENERAL

1.1	Transmitting Frequency	1626.5 to 1646.5 MHz
1.2	Receiving Frequency	1530.0 to 1545.0 MHz
1.3	Channel Interval	5 kHz
1.4	G/T	Better than -23 dB/K (elevation angle 5°)
1.5	EIRP	7 to 16 dBW (elevation angle 5°)
1.6	Modulation	BPSK
1.7	Modulation Rate	1200 sps
1.8	Coding	Convolution with coding rate 1/2 and constraint length 7
1.9	Decoding	Viterbi decoder
1.10	Internal GPS Board	GGA, ZDA, GLL, VTG, RMC, GSV (IEC61162-1)

2. ANTENNA UNIT

2.1	Antenna Type	Daisy Loop Antenna
2.2	Gain	
	Horizontal	Omnidirectional
	Vertical	Angle of elevation: 90° at 0 dBi or more
	Angle of elevation	5° at +1.3 dBi or more
2.3	Declination	Clockwise circular
2.4	Axial Ratio	Within 6 dB (5° to 90°)
2.5	VSWR	1.5 or less/ 50 ohm

3. SOURCE

3.1	Communication Unit	12 - 24 VDC: 6.0-2.0 A (Transmit), 0.6-0.4 A (Receive)

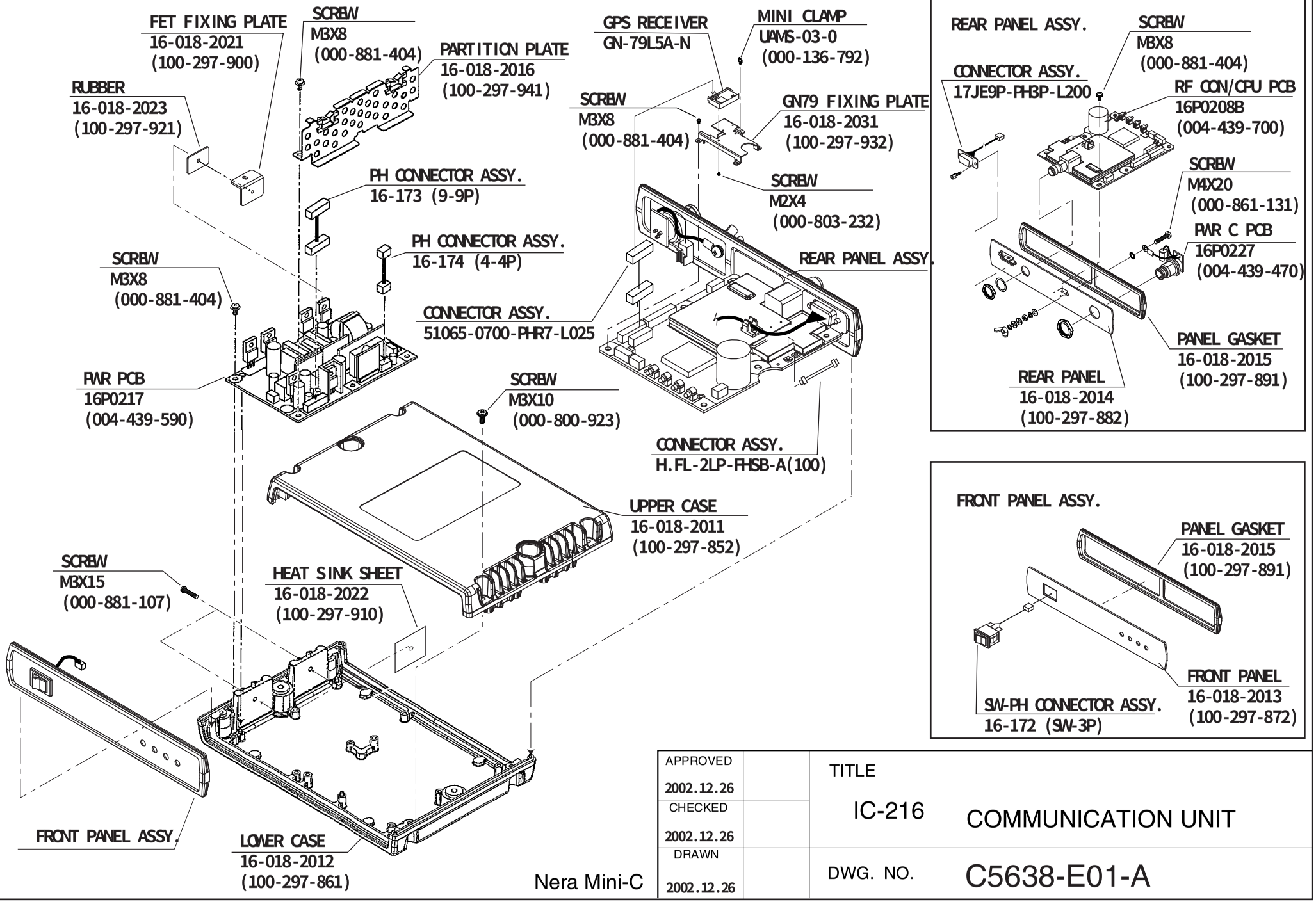
4. ENVIRONMENTAL CONDITION

4.1	Ambient Temperature	
	Above deck equipment	-35°C to +55°C
	Below deck equipment	-15°C to +55°C
4.2	Relative Humidity	95% (at +40°C)

4.3	Waterproof (IEC 60529)	
	Antenna Unit	IPX6
	Communication Unit	IPX2
	Others	IPX0
4.4	Vibration	IEC 60945

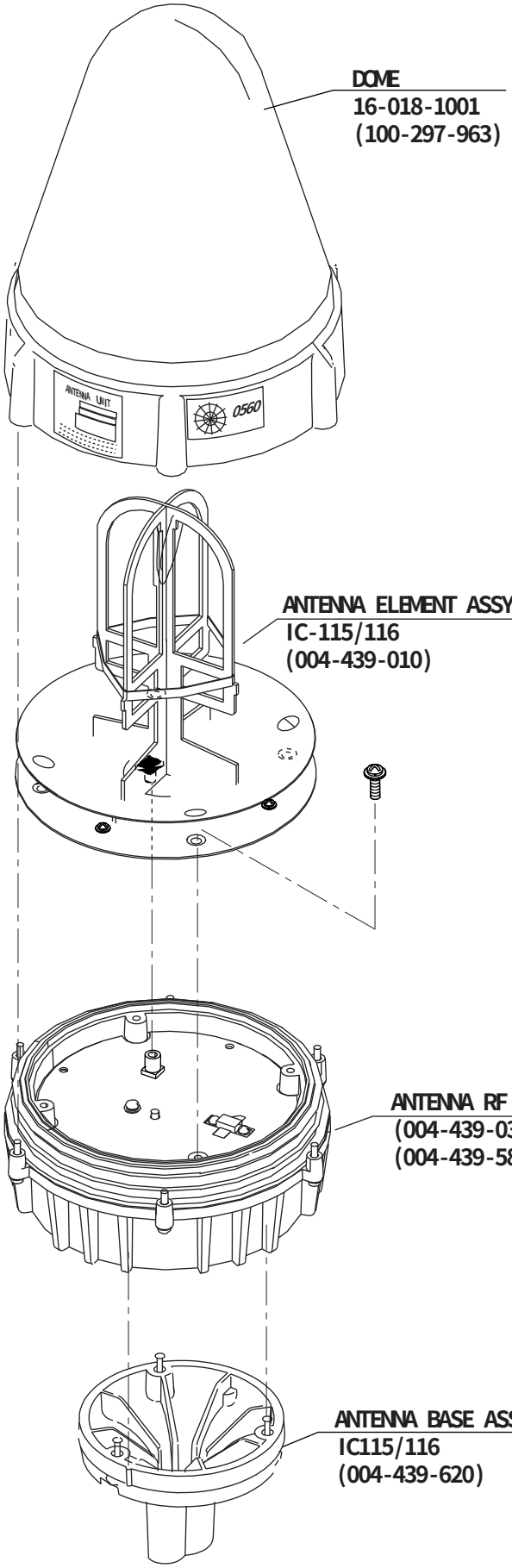
5. COATING COLOR

5.1	Antenna Unit	Upper: N9.5, Lower: 2.5PB3.5/10
5.2	Communication Unit	Cover: N3.0, Panel: N1.0
5.3	Others	2.5GY5/1.5



Nera Mini-C

APPROVED 2002.12.26		TITLE	
CHECKED 2002.12.26		IC-216	COMMUNICATION UNIT
DRAWN 2002.12.26		DWG. NO.	C5638-E01-A



APPROVED 2002.12.26	兼村	TITLE	
CHECKED 2002.12.26	高橋	IC-115 IC-116	ANTENNA UNIT
DRAWN 2002.12.26	三好	DWG. NO.	C5638-E02-A

Nera C
Nera Mini-C

NERA

ELECTRICAL PARTS LIST

2002 12

Model	IC-216		
Unit	COMMUNICTION UNIT		
Ref.Dwg.	C5638-K01-B	Page	
Blk.No.		**E-1**	

SYMBOL	TYPE	CODE No.	REMARKS	SHIPPABLE ASSEMBLY
	PRINTED CIRCUIT BOARD			
2B2	16P0208B, RF CON/CPU	004-439-700		√
2B3	16P0217, PWR	004-439-590		√
2B5	16P0223, PWR HIC	004-439-150		√
2B6	16P0222, PWR HIC	004-439-450		√
2B7	16P0224, PWR HIC	004-439-160		√
2B8	16P0220, PWR HIC	004-439-140		√
2B9	16P0225, PWR HIC	004-439-460		√
2B10	16P0227, PWR-C	004-439-470		√
	GPS RECEIVER	**GPS**		
2B	GN-79	000-146-179	GN-79L5A-N	
	CABLE w/CONNECTOR			
W1	16-172 (SW-3P)	004-439-500	SW-PH Connector	
W3	16-174 (4-4P)	004-439-520	PH Connector	
W4	16-173 (9-9P)	004-439-510	PH Connector	
W5	17JE9P-PH3P-L200	000-146-423		
W6	51065-0700-PHR7-L025	000-146-173		
W7	H. FL-2LP-FHSB-A (100)	000-146-259		

ELECTRICAL PARTS LIST

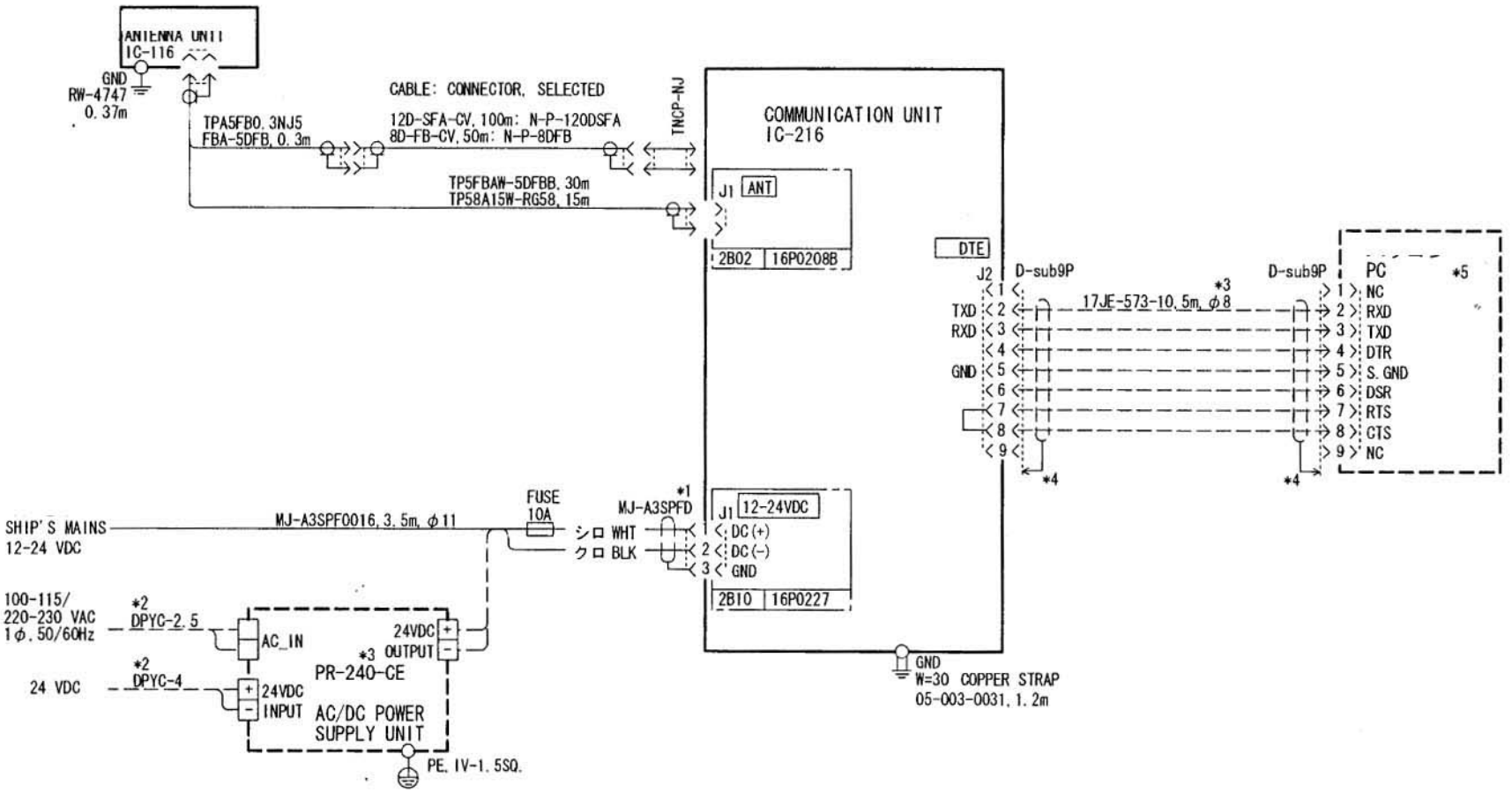
2002 12

Model	IC-116		
Unit	ANTENNA UNIT		
Ref.Dwg.	C5638-K03-A		Page
Blk.No.			**E-2**

SYMBOL	TYPE	CODE No.	REMARKS	SHIPPABLE ASSEMBLY
	ANTENNA ELEMENT			
	IC-115/116	004-439-010	16P0206	√
	ANTENNA CASE			
	IC-116	004-439-580	16P0216	√

Contents of Drawing

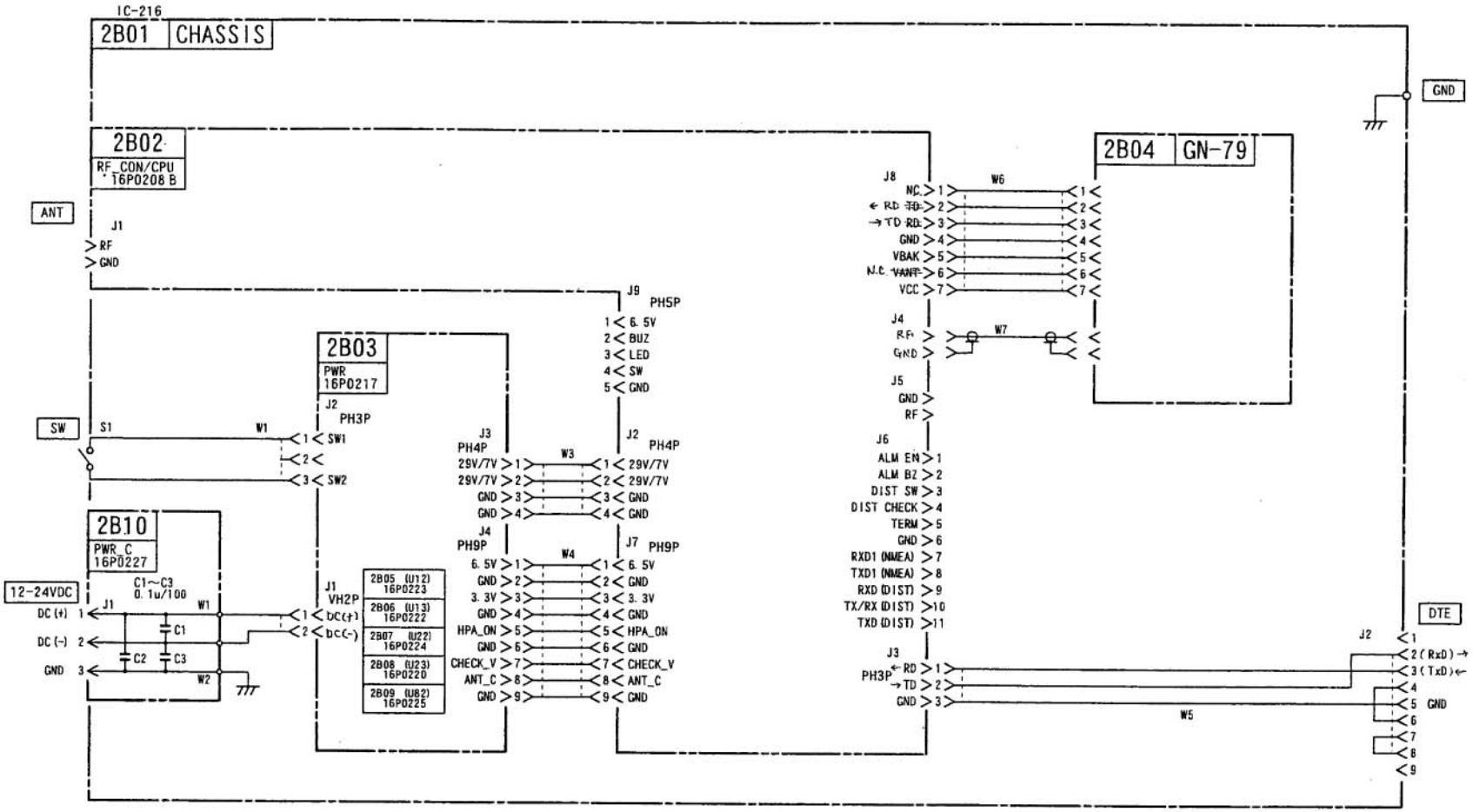
Name	Type	Dwg. No.	Page	Remark
Nera Mini-C Interconnection diagram	Nera Mini-C	C5638-C01	S-1	
Nera Mini-C Schematic diagram	Nera Mini-C	C5638-K01	S-2	
ANT RF	16P0216	C5638-K04	S-3	
RF CON/CPU	16P0208A/B(1/3)	C5635-K10	S-4	
	16P0208A/B(2/3)	C5635-K11	S-5	
	16P0208A/B(3/3)	C5635-K12	S-6	
PWR	16P0217	C5638-K02	S-7	
PWR HIC	16P0220	C5635-K14	S-8	Used for PWR p.c.b
	16P0222	C5635-K16	S-9	
	16P0223	C5635-K17	S-10	
	16P0224	C5635-K18	S-11	
	16P0225	C5635-K19	S-12	
AC/DC power supply	PR-240	C5003-K02	S-13	PR-240CE
PLE p.c.b (PR-240)	PLE24HSZ-P	C5003-K03	S-14	



NOTE
*1. FITTED AT FACTORY.
*2. SHIPYARD SUPPLY.
*3. OPTION.
*4. GROUND THRU CONNECTOR CLAMP.
*5. USER SUPPLY.

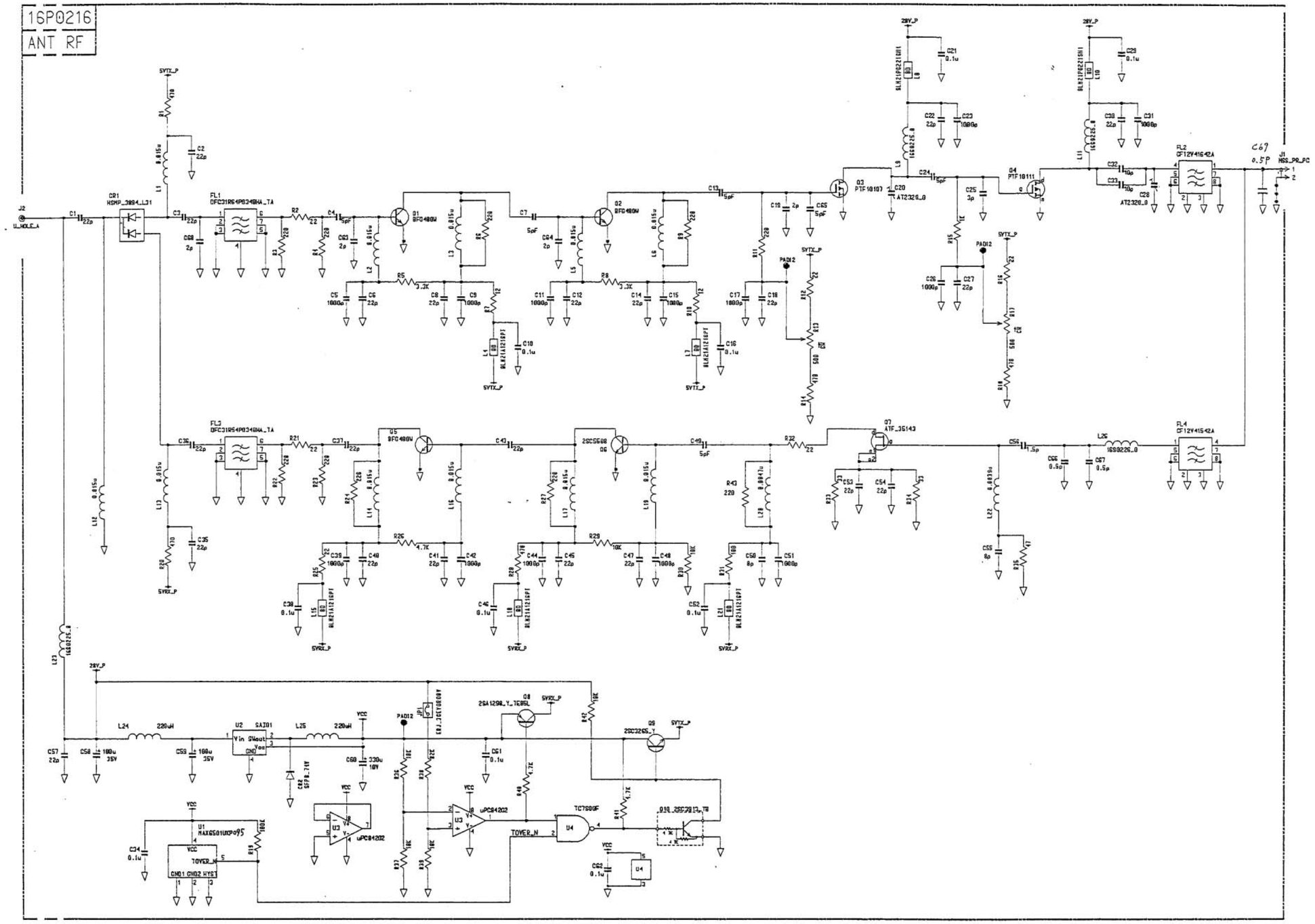
DRAWN Dec. 19 '02 T. YAMASAKI			TITLE
CHECKED Dec. 19 '02 Y. KIMURA			Nera Mini-C
APPROVED Dec. 19, '02 Y. Kimura			
SCALE	MASS kg		NAME INMARSAT-C MES
DWG No. C5638-C01- C			INTERCONNECTION DIAGRAM

S-1



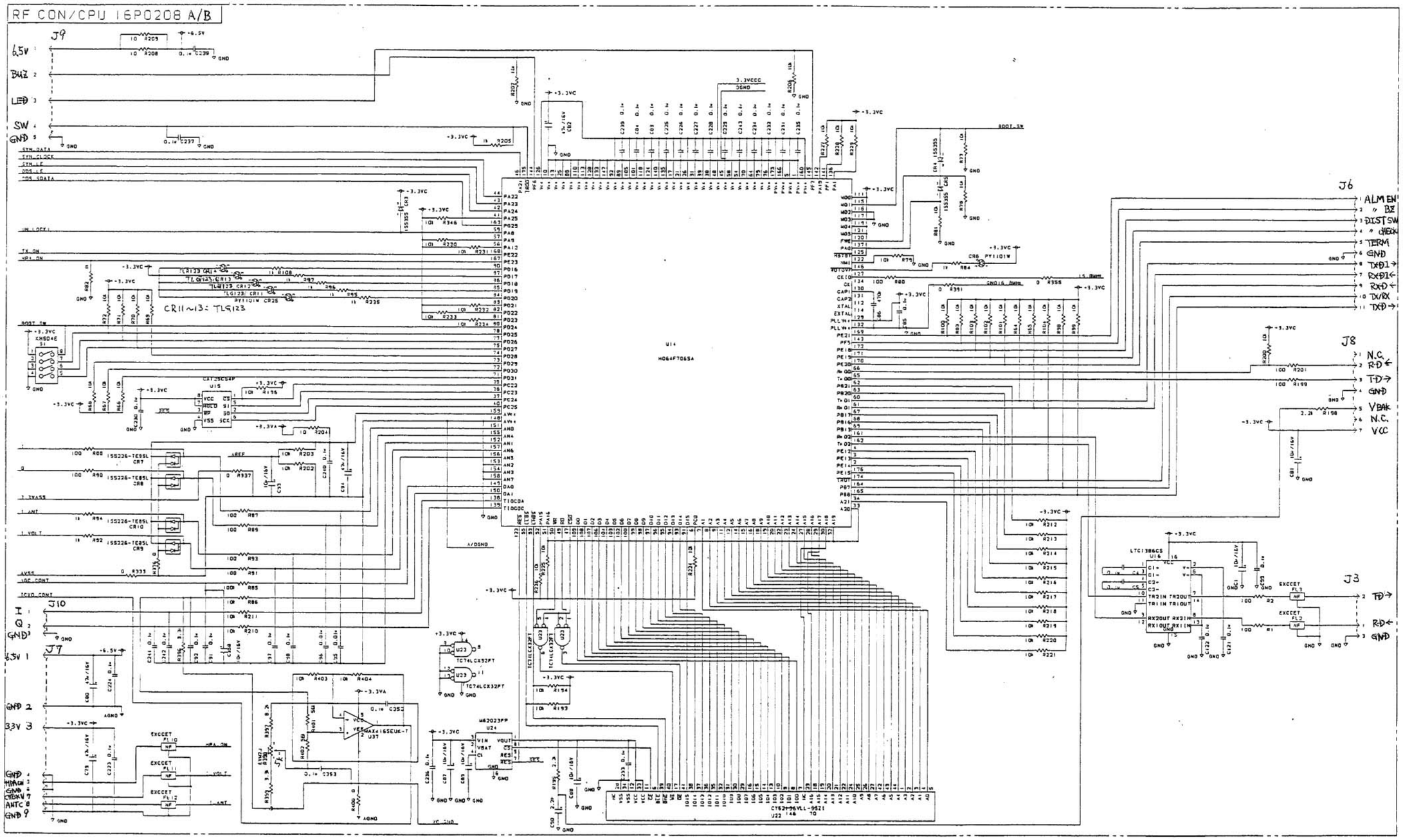
DRAWN 02/10/22 T. YAMASAKI			TYPE IC-216
CHECKED 02/10/22 Y.K.			
APPROVED 02/10/22 Y.K.		Nera Mini-C	
SCALE	MASS	MODEL BLOCK No.	NAME COMMUNICATION UNIT
Dwg No. C5638-K01- B		16-001-3203-0	SCHEMATIC DIAGRAM

16P0216
ANT RF



DRAWN 03/05/15	T. YAMASAKI			TYPE	16P0216
CHECKED 03/05/20	T. Matsuguchi				
APPROVED 03/05/20	S. Yoshimura	IC-116	1B 03		
SCALE	MASS	MODEL	BLOCK No.	NAME	ANT_RF PCB
Dwg No.	C5638-K04- B	16-001-3204-1			SCHEMATIC DIAGRAM

RF CON/CPU 16P0208 A/B



DRAWN 02/10/17 T. YAMASAKI			TYPE 16P0208A/B (1/3)
CHECKED 02/10/17 Y.K.			RF CON/CPU
APPROVED 02/10/17 Y.K.		IC-215/216	
SCALE	MASS	MODEL BLOCK No.	NAME RF CON/CPU PCB
Dwg No. C5635-K10- A		16-001-3197-3	SCHEMATIC DIAGRAM

RF CON/CPU 16P0208A/B

DRAWN 02/10/17 T. YAMASAKI	TYPE 16P0208A/B (2/3)
CHECKED 02/10/17 Y. K!	RF CON/CPU
APPROVED 02/10/17 Y. K!	IC-215/216
SCALE / MASS	MODEL / BLOCK No.
Dwg No. C5635-K11- A	16-001-3197-3
NAME	RF CON/CPU PCB
	SCHEMATIC DIAGRAM

RF CON/CPU 16P0208A/B

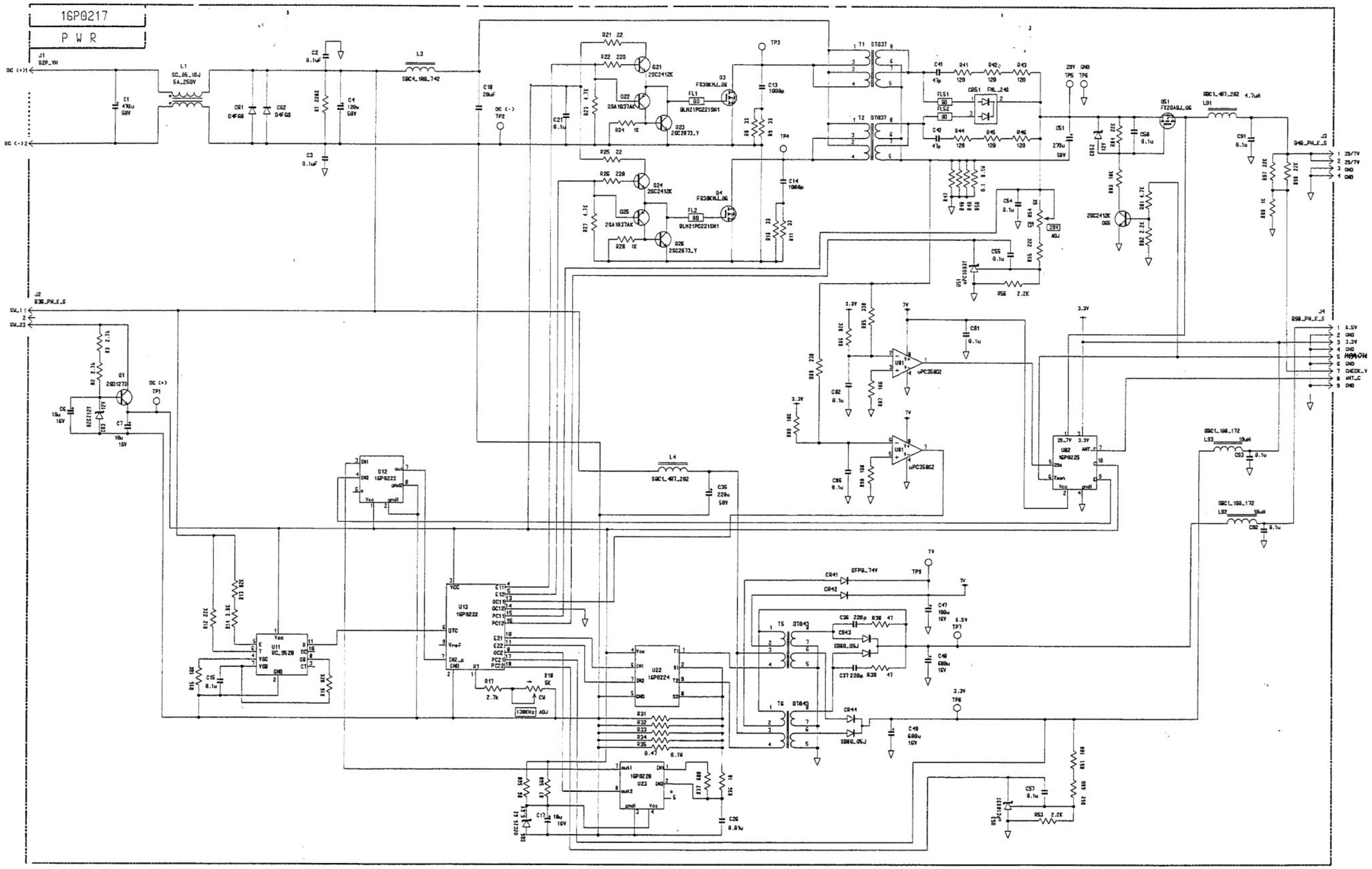
DRAWN 02/10/17 T. YAMASAKI	TYPE 16P0208A/B (3/3)
CHECKED 02/10/17 T.K	
APPROVED 02/10/17 T.K	IC-215/216
SCALE MASS	MODEL BLOCK No.
Dwg No. C5635-K12- A	16-001-3197-3
	NAME RF CON/CPU PCB
	SCHEMATIC DIAGRAM

NERA

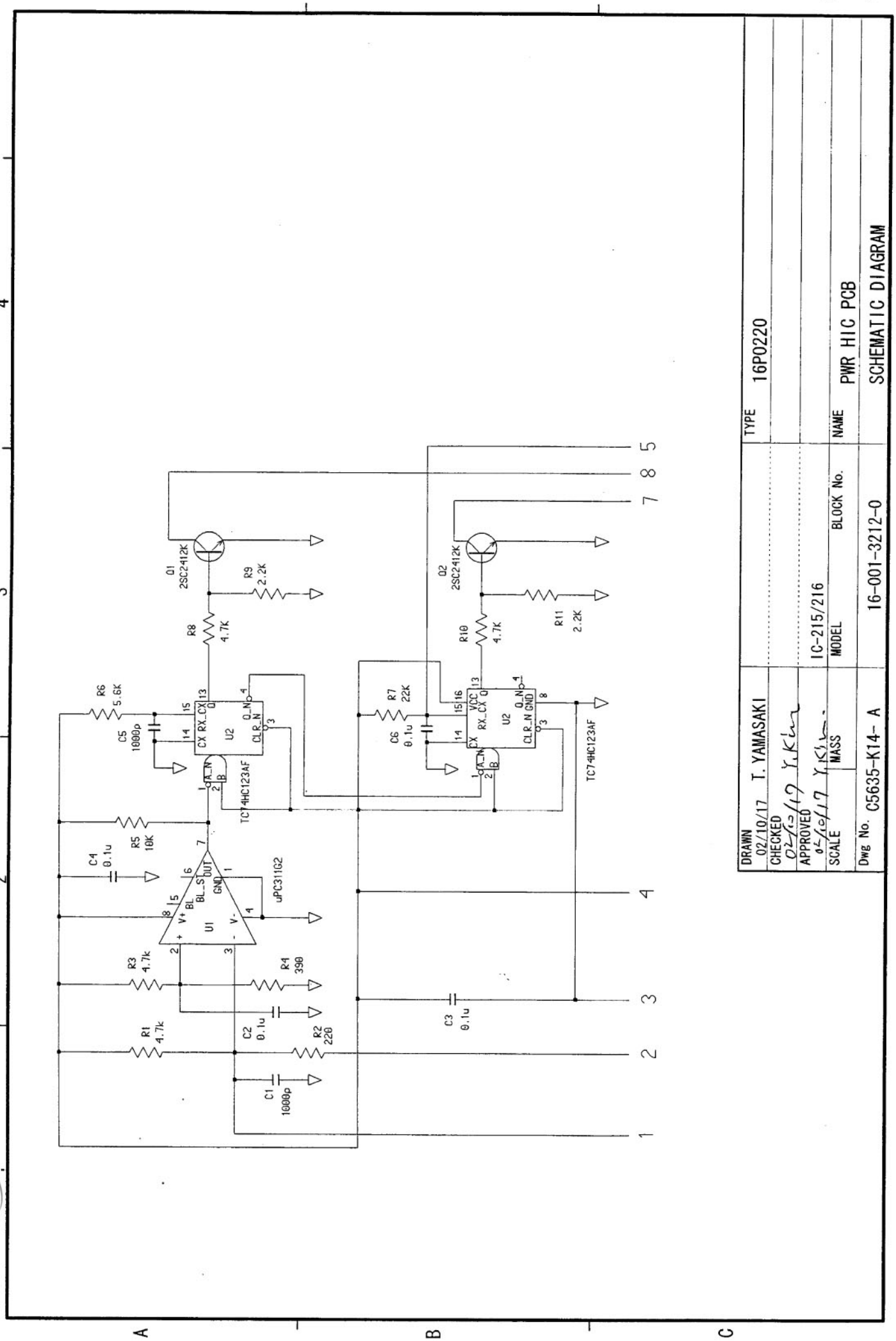
S - 7

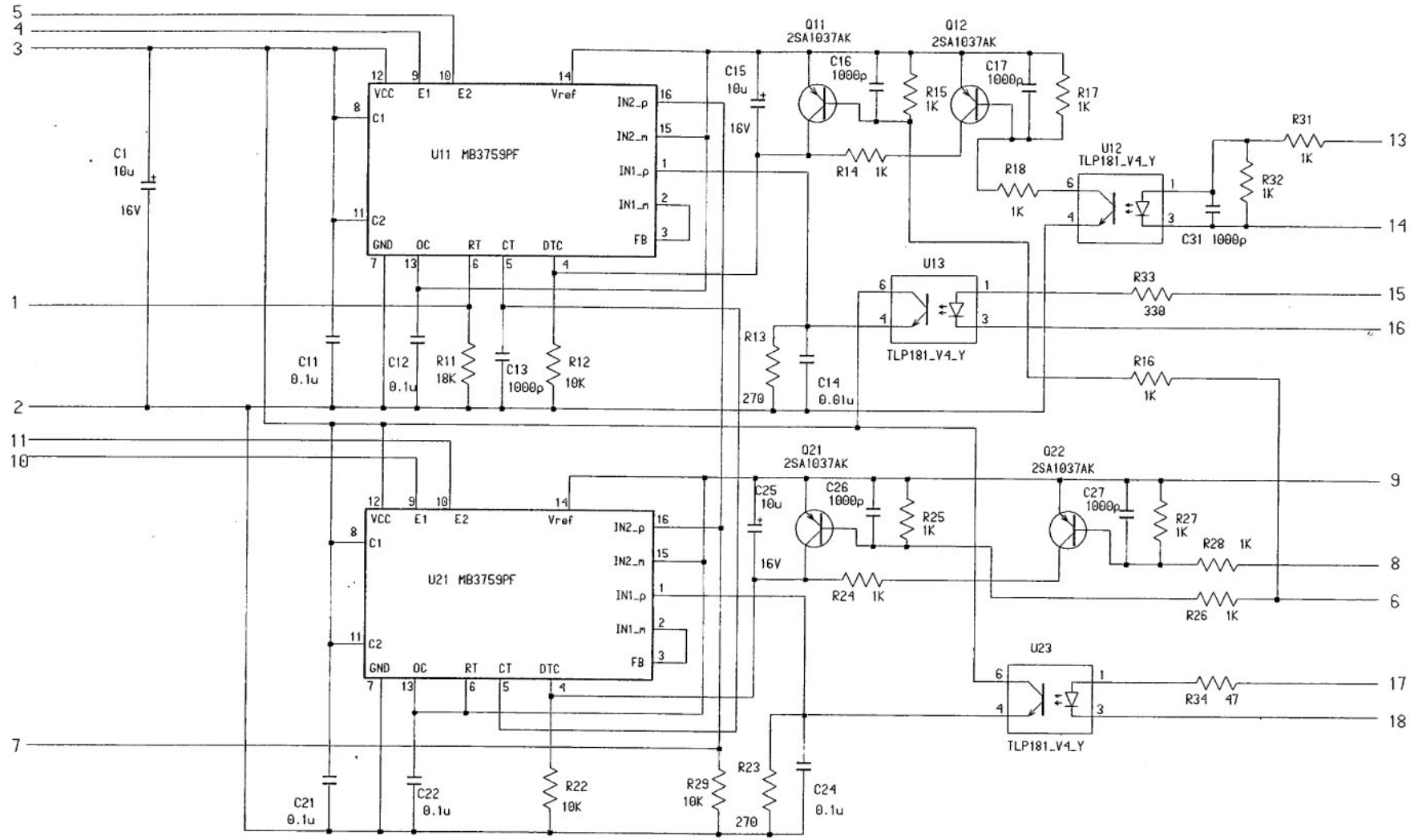
16P0217

P W R

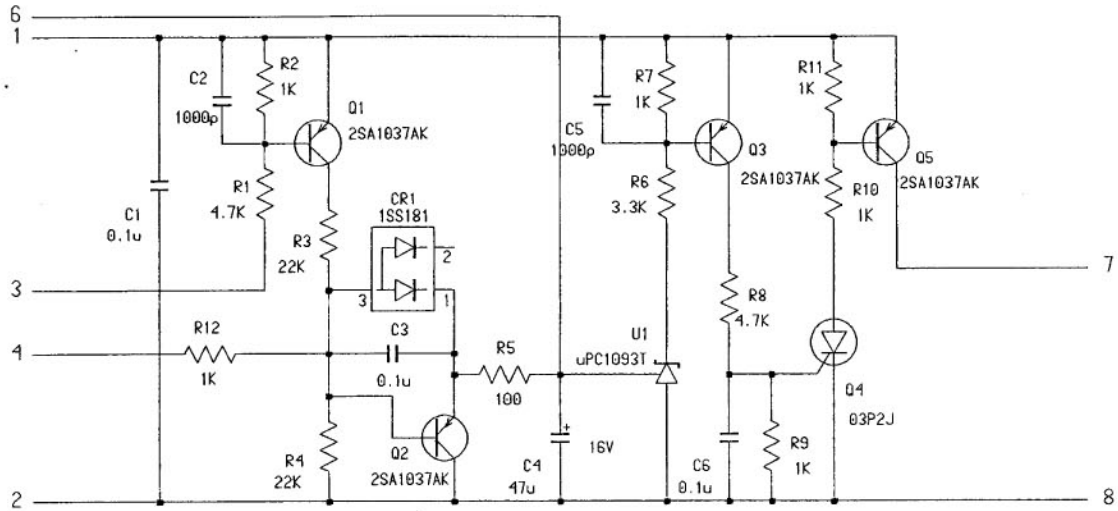


DRAWN 02/09/21 T. YAMASAKI			TYPE 16P0217
CHECKED 02/9/24 Y.K			
APPROVED 02/9/24 Y.K		IC-216	
SCALE	MASS	MODEL BLOCK No.	NAME PWR PCB
Dwg No. C5638-K02- A		16-001-3205-0	SCHEMATIC DIAGRAM

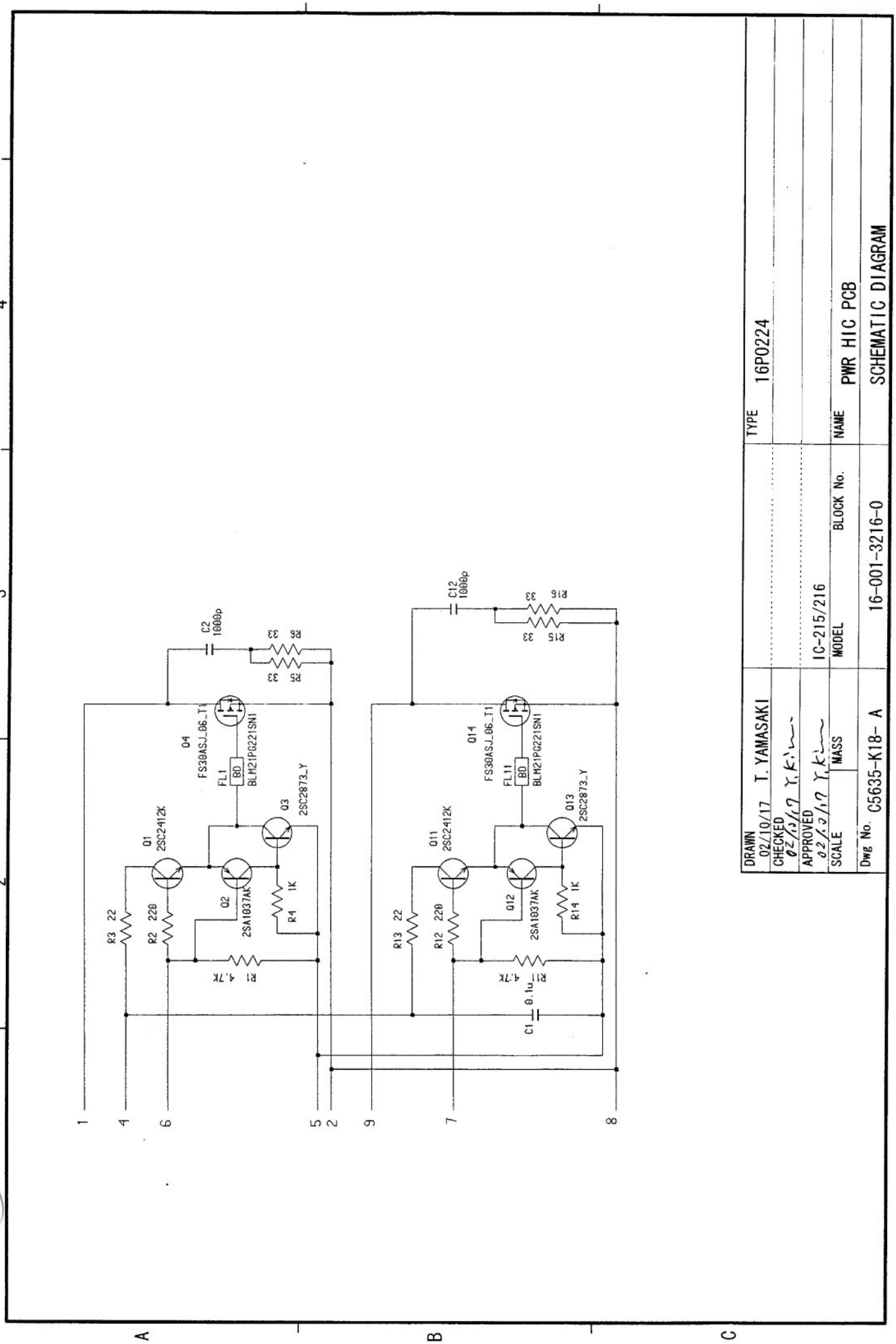

A
B
C
1
2
3
4
5
7
8
Q1
2SC2412K
Q2
2SC2412K
R1 4.7k
R2 220
R3 4.7k
R4 390
R5 10K
R6 5.6K
R7 22K
R8 4.7K
R9 2.2K
R10 4.7K
R11 2.2K
C1 1000p
C2 0.1u
C3 0.1u
C4 0.1u
C5 1000p
C6 0.1u
U1
uPC311G2
U2
TC74HC123AF
TC74HC123AF
DRAWN 02/10/17 T. YAMASAKI
CHECKED 02/10/17
APPROVED 02/10/17
SCALE MASS
MODEL IC-215/216
BLOCK No.
TYPE 16P0220
NAME PWR HIC PCB
Dwg No. C5635-K14- A
16-001-3212-0
SCHEMATIC DIAGRAM



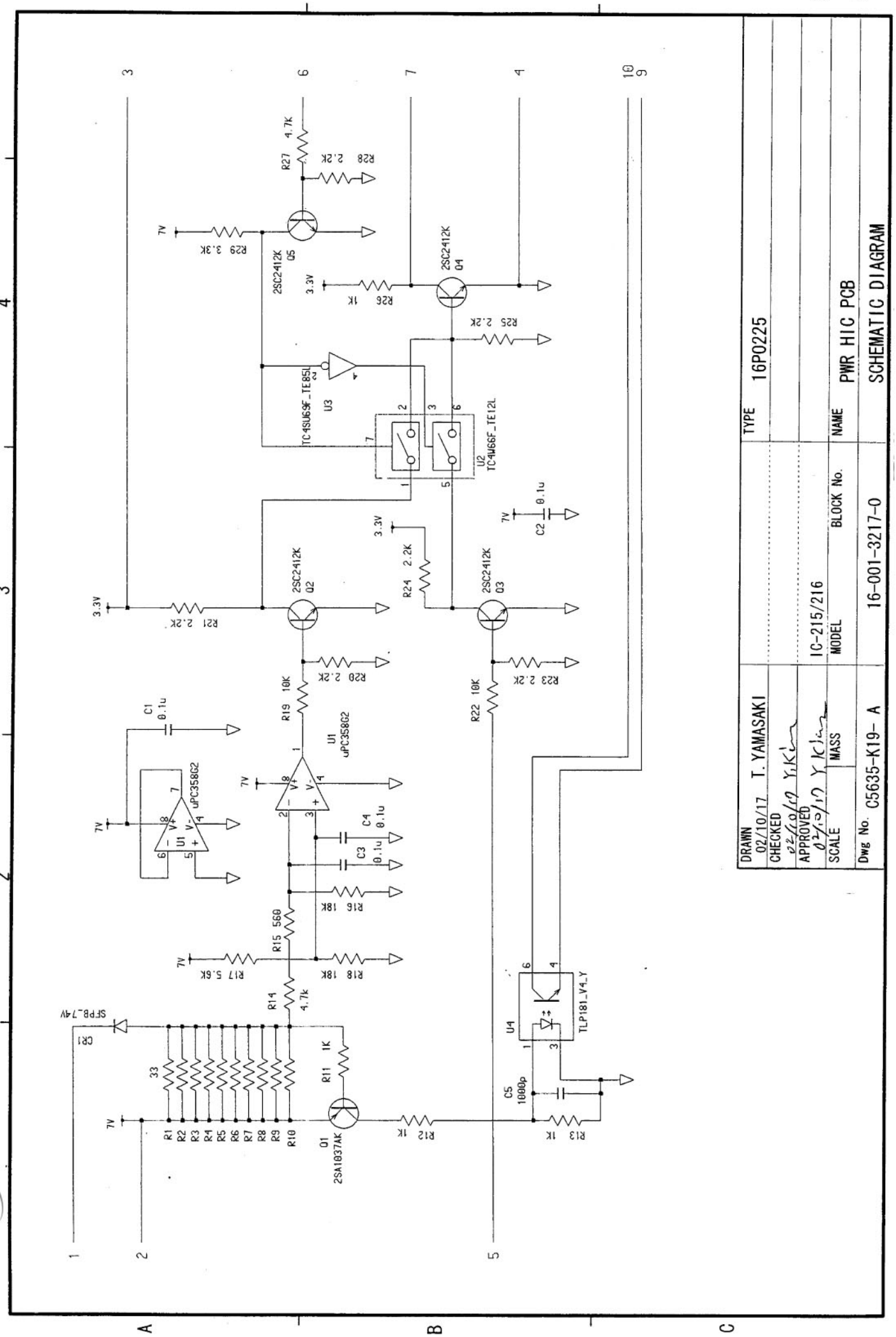
DRAWN 02/10/17 T. YAMASAKI			TYPE 16P0222
CHECKED 02/10/17 T.K!			
APPROVED 02/10/17 T.K!		IC-215/216	
SCALE	MASS	MODEL BLOCK No.	NAME PWR HIC PCB
Dwg No. C5635-K16- A		16-001-3214-0	SCHEMATIC DIAGRAM

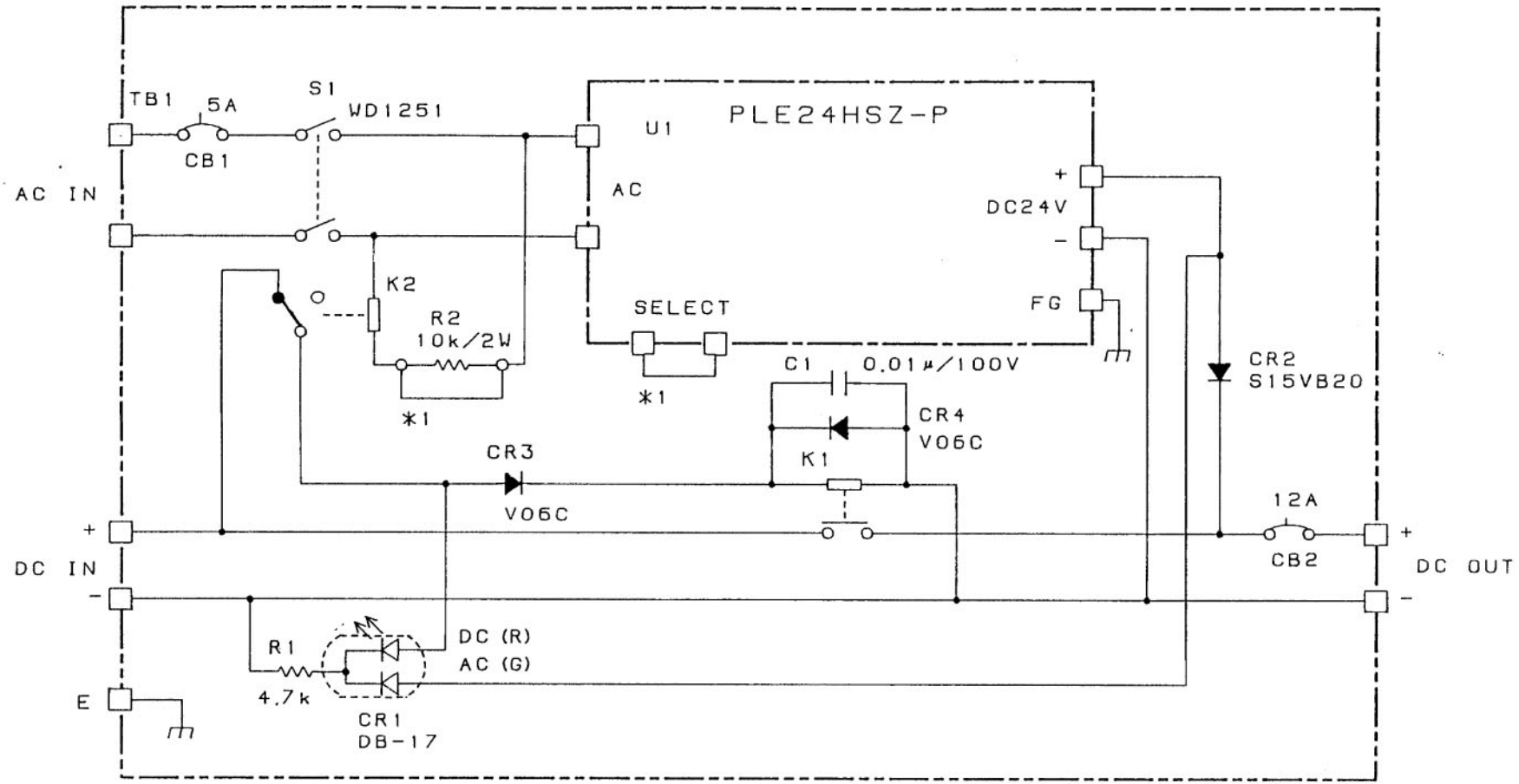


DRAWN 02/10/17 T. YAMASAKI			TYPE 16P0223
CHECKED 02/10/17 Y.Kim			
APPROVED 02/10/17 Y.Kim		IC-215/216	
SCALE	MASS	MODEL BLOCK No.	NAME PWR HIC PCB
Dwg No. C5635-K17- A		16-001-3215-0	SCHEMATIC DIAGRAM



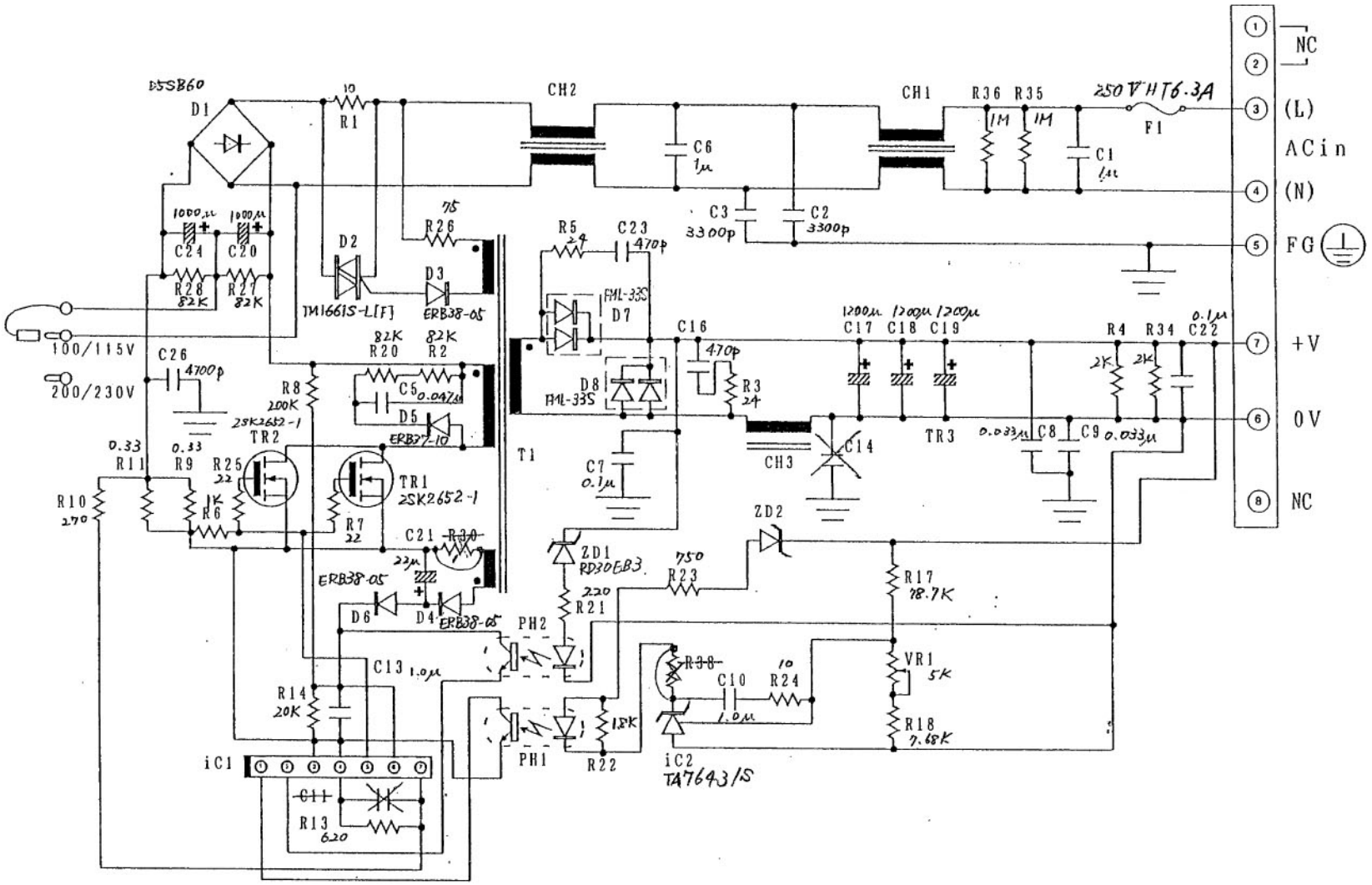
DRAWN 02/10/17 T. YAMASAKI		TYPE	16P0224
CHECKED 02/10/17			
APPROVED 02/10/17	IC-215/216		
SCALE	MODEL	NAME	PWR HIC PCB
MASS	BLOCK No.		
Dwg No. C5635-K18- A	16-001-3216-0		SCHEMATIC DIAGRAM


DRAWN 02/10/17 T. YAMASAKI
CHECKED
APPROVED
SCALE MASS
TYPE 16P0225
MODEL IC-215/216
BLOCK No.
NAME PWR HIC PCB
Dwg No. C5635-K19- A
16-001-3217-0
SCHEMATIC DIAGRAM
2SC2412K Q2
2SC2412K Q3
2SC2412K Q4
2SC2412K Q5
TC4SU69F_TE85L U3
TC4W66F_TE12L U2
uPC358G2 U1
2SA1037AK Q1
TLP181_V4_Y U4
SFPB-7.4V CR1
R1 33
R2 33
R3 33
R4 33
R5 33
R6 33
R7 33
R8 33
R9 33
R10 33
R11 1K
R12 1K
R13 1K
R14 4.7K
R15 560
R16 18K
R17 5.6K
R18 18K
R19 10K
R20 2.2K
R21 2.2K
R22 10K
R23 2.2K
R24 2.2K
R25 2.2K
R26 1K
R27 4.7K
R28 2.2K
R29 3.3K
C1 0.1u
C2 0.1u
C3 0.1u
C4 0.1u
C5 1000p
3.3V
7V



*1 : AC100V(CLOSE)
AC200V(OPEN)

DRAWN Apr 18 '97 T.YAMASAKI				TYPE PR-240
CHECKED Apr.22'97 K.Kusunoki				
APPROVED APR. 22 '97 H.Yamaguchi				
SCALE /	MASS kg	APPLICABLE TO; (MODEL)	BLOCK NO.	NAME RECTIFIER
DWG NO. C5003-K02- A				SCHEMATIC DIAGRAM



DRAWN 02/06/24 T. YAMASAKI			TYPE PLE24HSZ-P
CHECKED 02/6/24 Y. K.			
APPROVED 02/6/20 Y. K.		PR-240	
SCALE	MASS	MODEL BLOCK No.	NAME PLE PCB
Dwg No. C5003-K03- A			SCHEMATIC DIAGRAM

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